10.0 LONG-TERM AVERAGES AND VARIABILITY FACTORS

This section summarizes the technology effectiveness evaluation and the long-term average (LTA) concentrations and variability factors calculated for the selected end-of-pipe MP&M wastewater treatment technologies. These technologies are:

- Chemical precipitation and clarification (using sedimentation or membrane filtration) with preliminary treatment, where applicable, for treatment of regulated metals and suspended solids. Preliminary treatment may include chromium reduction, batch chemical precipitation for concentrated waste streams, and chemical reduction/precipitation of chelated metals.

- Ultrafiltration for treatment of oil and grease and organic pollutants.

- Dissolved air flotation (DAF) for treatment of oil and grease and organic pollutants.

- Chemical emulsion breaking and oil-water separation for treatment of oil and grease and organic pollutants.

- Cyanide destruction with alkaline chlorination for treatment of cyanide.

Section 8.3 describes these technologies in detail, as well as the physical and chemical principles underlying their operation. Section 3.3 describes EPA's data-gathering activities at MP&M sites that use each of these technologies.

This section describes the data sources used in the technology effectiveness evaluation (Section 10.1); the data-editing procedures used in assessing the technologies (Section 10.2); and the LTA concentrations, variability factors, and limitations calculated from this assessment (Sections 10.3 and 10.4).

EPA used the following methodology to estimate the daily maximum and monthly average limitations for the regulated pollutants:

1. Identify the sampling episodes that match the technology option (Section 10.1).

2. Evaluate the data from each episode to identify data that demonstrate effective treatment (Section 10.2).

3. Calculate the LTA for each sampling episode data set from the daily effluent concentrations for each pollutant passing the technology effectiveness evaluation. The episode-level LTA for each pollutant is the arithmetic average of the daily concentration at each sampling episode. For samples where a pollutant was not detected, EPA used the sample detection limit to calculate the LTA. The Agency defined the LTA for each pollutant as the median of the episode-level LTAs (Section 10.3.4).

4. Use the modified delta-lognormal model to estimate episode-level daily and episode-level 4-day average variability factors (Section 10.3.1) for those episode data sets that had at least four samples of a pollutant passing the technology effectiveness evaluation, including at least two detected values.

5. Determine the daily variability factor and the 4-day average variability factor. EPA defines the daily variability factor for a pollutant as the average of the episode-level daily variability factors and defines the 4-day average variability factor as the average of the episode-level 4-day average variability factors (Section 10.3.5).

6. Calculate the daily and monthly average limitations by multiplying the constituent LTA by the daily and 4-day constituent variability factors, respectively (Section 10.3.7).

10.1 Sources of Technology Performance Data

EPA, industry, and local sanitation districts collected data from wastewater treatment systems during separate sampling episode programs conducted at MP&M facilities. Sampling episode reports maintained in the administrative record for this rulemaking present the data collected during each sampling episode. All sampling episodes were conducted using the EPA sampling and chemical analysis protocols as described in Section 3.3. The following subsections describe sampling programs conducted by EPA and other entities as well as industry-supplied monitoring data.

To determine the limits for each subcategory for each technology option, EPA subdivided the data by subcategory and technology option. Section 7.0 discusses regulated pollutants for MP&M subcategories. Table 10-1 lists the number of evaluated treatment systems per subcategory.

10.1.1 EPA Sampling Program

EPA conducted 57 sampling episodes at MP&M sites ranging from one to five days as discussed in Section 3.3. To assess possible influent and effluent variability caused by variations in site operations, EPA conducted multiple sampling episodes at three of these sites. Data from these sampling episodes are stored in the LTA Database. Table 10-2 summarizes the number of sampling episodes and data points in the LTA Database from EPA-conducted sampling episodes.

For some sampling points on some days, EPA collected duplicate samples for quality assurance checks, or multiple sample fractions to develop manual composite samples. EPA averaged the concentrations as described below for evaluating treatment performance and calculating long-term averages and variability factors.

- *Duplicate samples.* As discussed in Section 4.0, EPA collected duplicate samples at many sampling points as a quality control measure. EPA averaged the concentrations for the original and duplicate samples for each parameter. For samples where a pollutant was not detected in a sample, EPA used the sample detection limit to calculate the average.

- *Multiple composite fractions.* EPA collected multiple grab composite samples for oil and grease and total petroleum hydrocarbons. For these samples, EPA averaged the composite results over the sample day. When a pollutant was not detected in a sample, EPA used the sample detection limit to calculate the average.

10.1.2 Sampling Episodes Conducted by Industry and Local Sanitation Districts

Local sanitation districts and the industry conducted sampling episodes ranging from three to five days as discussed in Section 3.3. To assess possible influent and effluent variability caused by variations in site operations, sanitation districts conducted multiple sampling episodes at two sites, one of which EPA also sampled. Data from these sampling episodes are stored in the LTA Database. Table 10-3 summarizes the number of sampling episodes and data points in the LTA Database associated with samples collected by industry and local sanitation districts.

10.1.3 Industry-Supplied Effluent Monitoring Data

To augment data collected during sampling episodes, EPA requested effluent monitoring data from sampled sites to further evaluate and refine variability factors. EPA attempted to obtain effluent monitoring data that represented each regulated subcategory and each technology option and used industry effluent data that met the following criteria:

- Data were from a treatment system passing all criteria in the technology-effectiveness evaluation (see Section 10.2).

- The site collected effluent monitoring data from a location comparable to the one used by EPA during the sampling episode (e.g., the site did not typically commingle the effluent with other waste streams, such as storm water or sanitary waste, before the sampling point). As an exception, EPA used a site's data even when the monitoring location followed pH adjustment, since this treatment step would not change the concentrations of regulated pollutants.

- Wastewater treatment processes were comparable to those at the time of the sampling episode (i.e., no changes were made to the system that could change treatment effectiveness). If the wastewater treatment process had been modified, EPA requested data for a period when the treatment processes were similar to those at the time of the sampling episode.

- Wastewater treatment influent characteristics were comparable to those at the time of the sampling episode (i.e., the site made no major manufacturing process changes that would change the influent characteristics). If changes had occurred subsequent to the sampling episode, EPA requested data for a period when processes were similar to those during the sampling episode.

EPA collected data during site visits and sampling episodes, from voluntary submissions by sites, or by written request. The database contained additional effluent data from 14 sites. Table 10-4 summarizes supplementary effluent monitoring data obtained from sites. Because these data are not in a form that allows direct use for calculating limits or for comparison to the proposed limits, EPA was not able to use these data in setting or evaluating the compliance aspects of the proposed limits and standards. However, following proposal, EPA will reformat and evaluate these long-term effluent monitoring data in relation to the proposed limits.

10.2 Evaluation of Treatment Effectiveness

EPA reviewed MP&M sampling data to identify data from well-designed and well-operated treatment systems to calculate the LTA concentrations and variability factors. During the review, EPA focused on data for pollutants processed and treated by the MP&M industry. Figure 10-1 summarizes the technology effectiveness data-editing procedures discussed in this section. As shown on this figure, the data editing process consisted of four major steps:

1. Identification of pollutants not present in the raw wastewater at sufficient concentrations to evaluate treatment effectiveness;

2. Assessment of general performance of the treatment system;

3. Identification of process upsets that could affect treatment effectiveness and sampling techniques that could affect data quality; and

4. Identification of wastewater treatment chemicals.

EPA did not calculate LTAs for pollutants that were not MP&M pollutants of concern (see Section 7.0). The LTA database contains 59,211 influent and effluent data points for MP&M pollutants of concern associated with the MP&M end-of-pipe technology options. Of these data points, 29,639 were influent data points. A data point is a concentration of a specific constituent from a given sampling day at a sampled point.

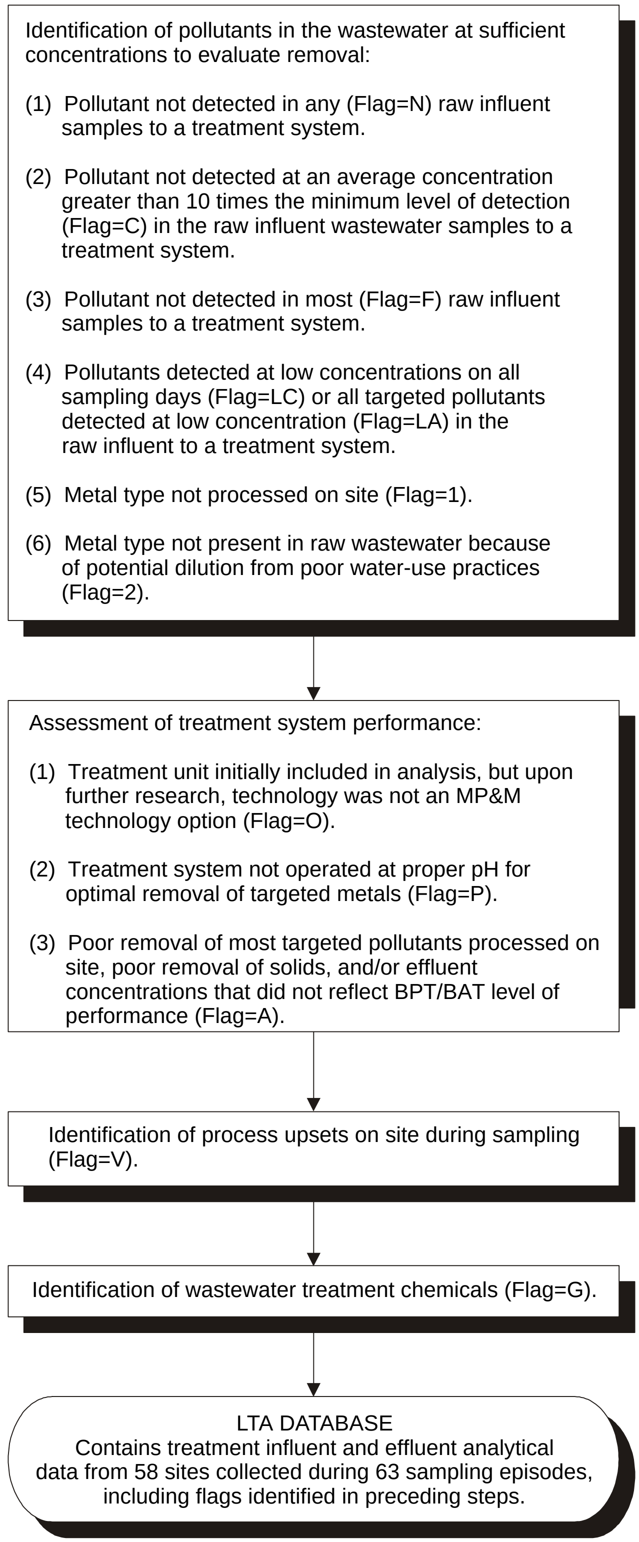

Figure 10-1. Summary of Technology Performance Data-Editing Procedures

EPA flagged each data point failing an evaluation criterion and only included unflagged effluent data points in the LTA and variability factor calculations. One pollutant at a sampling point could have multiple flags, depending on the number of evaluation criteria it did not meet. Where EPA conducted multiple episodes at one site, the Agency evaluated each episode separately; therefore, EPA may have flagged a pollutant for a different reason for each episode. Sections 10.2.1 through 10.2.4 describe the flags used in editing the database. Table 10-5 lists the number of effluent data points flagged for each technology option. The number of flagged data points listed in this table reported only the initial flag for a pollutant. For example, as shown in Table 10-5, EPA flagged 2,061 data points with a "N" flag. Of the remaining unflagged points, the Agency flagged 453 with a "C" flag, then of the remaining unflagged data, it flagged 10 with an F (see Figure 10-1 for a description of each flag).

Table 10-6A presents data from sampled facilities from all applicable subcategories for total and amenable cyanide. Tables 10-6B through 10-6J present, for each pollutant proposed for regulation and each subcategory, the daily effluent concentration for all other data points that passed the data editing criteria. The Steel Forming and Finishing Subcategory's mass-based limits are based on the General Metals Subcategory concentration limits; therefore, data for both subcategories are presented together on Table 10-6B through 10-6J. Tables 10-6B only list data from sampled facilities within each subcategory. In developing the proposed effluent limitations and standards, EPA, in certain cases, transferred LTAs and variability factors from other subcategories (see Tables 10-8B through 10-8K).

10.2.1 Identification of Pollutants Not Present in the Raw Wastewater at Sufficient Concentrations to Evaluate Treatment Effectiveness

EPA evaluated the concentrations of pollutants of concern in the influent to each treatment system to determine which pollutants were present at concentrations high enough to assess the treatment effectiveness of the system. EPA flagged the influent and corresponding effluent data points for all specific pollutants in a treatment system that met the following criteria:

1. EPA assigned a flag of "N" to a pollutant if EPA did not detect the pollutant in any of the raw influent wastewater samples to a treatment system during a sampling episode.

2. EPA assigned a flag of "C" to a pollutant if EPA did not detect the pollutant in the raw influent wastewater to a treatment system at an average concentration of greater than 10 times the minimum level of detection during the sampling episode. The minimum level is the lowest concentration that can be reliably measured by an analytical method. EPA calculated the average influent concentration using the sample detection limit when the pollutant was not detected in the influent.

3. EPA assigned a flag of "F" to a pollutant if EPA detected the pollutant in the raw influent to a treatment system at an average concentration greater than 10 times the minimum level (see Step 2), but the Agency did not detect the pollutant on most sampling days, and, when detected, EPA detected it at a low concentration. EPA assigned this flag on a case-by-case basis for each pollutant.

4. EPA assigned a flag of "LC" to a pollutant if EPA detected the pollutant in the influent to a treatment system at an average concentration greater than 10 times the minimum level (see Step 2) but EPA did not detect the pollutant on all sampling days at concentrations high enough to assess treatment effectiveness. EPA assigned this flag on a case-by-case basis for each pollutant.

5. EPA assigned a flag of "LA" on a case-by-case basis to all pollutants associated with a treatment system if the concentrations of all the targeted pollutants detected in the raw influent were not detected at high enough concentrations to assess treatment effectiveness. EPA assigned this flag to all effluent points associated with three episode-specific treatment units: one ultrafiltration unit, one DAF unit, and one chemical precipitation with microfiltration for clarification.

6. If a sampled site did not process a raw material associated with a pollutant (e.g., cadmium or cyanide) then EPA assigned all unflagged data points for that pollutant a flag of "1." EPA assigned this flag to specific pollutants at effluent points associated with 14 chemical precipitation systems.

7. Because the proposed MP&M effluent limitations guidelines and standards include water conservation practices and pollution prevention technologies, EPA reviewed information obtained from sampled sites to identify unit operations for which sites did not have water conservation and pollution prevention technologies in place. EPA assigned a flag of "2" to pollutants affected by poor water-use practices. If the poor water-use practices only affected a specific pollutant (for example, a cadmium electroplating line that did not have water conservation practices in place), EPA assigned this flag only to the affected pollutant.

   EPA assigned this flag to specific metals in the effluent data for seven chemical precipitation systems and cyanide effluent data for one cyanide destruction system. EPA also assigned this flag to all effluent data points for a chemical precipitation system sampled during two episodes because sampling personnel discovered that overflow rinses from metal finishing operations flowed to the treatment system when the site discontinued production, thus diluting the influent stream to the treatment system.

10.2.2 Assessment of General Treatment System Performance

EPA assessed the performance of each sampled treatment system to identify well-designed and well-operated systems. For this assessment, EPA first identified MP&M unit operations performed on site to determine which pollutants (e.g., metals, cyanide, and oil and grease) the site generated. EPA focused on these pollutants to assess treatment systems because sites design systems to treat the specific pollutants generated on site. In some cases, complete data on the types of pollutants generated at a site were unavailable because EPA toured only a portion of the site. In these cases, EPA reviewed the concentrations of pollutants in the raw wastewater to identify pollutants generated on site. EPA then performed the following technical analyses of the treatment systems to determine which data would be included in the LTA concentrations and variability factors.

1. EPA identified treatment systems that included technologies that were not a part of EPA's technology options.

    - EPA identified one chemical precipitation and sedimentation system that included biological treatment and assigned an "O" flag to all the effluent data associated with this treatment system.

    - EPA identified a cyanide destruction system that added chlorine gas for treatment and assigned an "O" flag to cyanide data for the effluent associated with this treatment system.

2. EPA identified chemical precipitation and cyanide destruction systems that the site did not operate at the optimum pH for treatment of the targeted pollutants. The optimum pH for removal of metals by a chemical precipitation system varies with the combination of metals processed at a site; therefore, EPA based its evaluation of each chemical precipitation system on the site-specific metals processed or treated.

    - EPA assigned a flag of "P" to all effluent data associated with four chemical precipitation and sedimentation systems identified as operating outside pH ranges considered to be optimum for removal of the site-specific targeted metals.

    - EPA assigned flag of "P" to all amenable and total cyanide effluent data associated with two cyanide destruction systems identified as operating outside the optimum pH range for cyanide oxidation.

3. EPA identified treatment systems where the targeted pollutants present in the influent did not decrease across the treatment system, the system had poor removal efficiencies for targeted pollutants, or the effluent concentrations for particular pollutants did not reflect BPT/BAT level of

performance. Because pollutants targeted for removal depend on the pollutants processed at a site and by the treatment technology, EPA evaluated each treatment system separately, depending on the site operations and treatment technology.

Chemical precipitation and sedimentation systems remove metals by sedimentation of metal hydroxides in the form of suspended solids; poor removal of total suspended solids (TSS) typically indicates poor removal of metals in these systems. Therefore, in addition to analyzing for poor metals removal, EPA identified chemical precipitation systems that did not have good TSS removal.

- Of the unflagged data, EPA identified four chemical precipitation systems with poor removal of targeted metals and assigned an "A" flag to all effluent data associated with these systems.

- EPA assigned an "A" flag to amenable and total cyanide effluent data for one cyanide destruction unit identified with poor cyanide removal.

- EPA identified two chemical precipitation systems at two indirect discharging facilities where the average copper and total suspended solids effluent concentrations were greater than the current BPT regulations for these pollutants under 40 CFR 433; therefore, treatment was not indicative of BPT/BAT for direct dischargers. EPA assigned an "A" flag for all copper and total suspended solids data for these two sites.

- EPA identified two indirect discharging facilities where the average total suspended solids effluent concentration in the chemical precipitation system was greater than the current BPT regulation for total suspended solids under 40 CFR 433; therefore, treatment was not indicative of BPT/BAT for direct dischargers. EPA assigned an "A" flag to effluent data for total suspended solids for these treatment systems.

- EPA identified four oily waste facilities that were indirect dischargers and were not required by their publicly owned treatment works (POTW) to control oil and grease to BPT levels. EPA assigned an "A" flag to the effluent data for oil and grease for these four sites.

10.2.3 Identification of Process Upsets That Could Affect Data Quality

EPA reviewed sampling episode reports and data for each sampling episode to identify process upsets occurring on site that could impact treatment efficiency. In this review, EPA also identified any sampling techniques that could affect the validity of analytical data. EPA assigned a flag of “V” to affected pollutants on the days that a system could have been impacted by a process upset or sampling technique. For example, if a process upset or poor sampling technique only occurred on one day, EPA assigned only the data for that day a “V” flag, or if a process upset or poor sampling technique affected only specific pollutants, EPA assigned only the affected pollutants a “V” flag. Because a treatment system may have been sampled during multiple sampling episodes and EPA evaluated each episode separately, the Agency may have flagged a system or pollutant with a “V” during one episode but not for another episode. Below are the results of this analysis.

- EPA identified a chemical precipitation system in which site personnel used barrel finishing wastewater containing iron and aluminum as a flocculation agent. During two sampling days, site personnel used a different barrel finishing solution. On those days, the concentration of metals in the effluent increased, indicating the new solution was not an effective flocculation agent. EPA assigned a “V” flag to all effluent data associated with the two sampling days when the site used the new solution.

- EPA identified a chemical precipitation system in which the effluent concentrations of copper were elevated and copper removal efficiencies were lower than other metals treated by the system. The concentration of cyanide in the influent system was also elevated compared to cyanide concentrations typically seen at other MP&M facilities. These data indicated that the site discharged some copper-cyanide chelates to the system, affecting the system’s ability to effectively precipitate copper. EPA sampled this unit during multiple sampling episodes, and it assigned a “V” flag to all effluent data for copper during these sampling episodes.

- EPA identified a chemical precipitation system where the effluent concentrations of chromium were elevated compared to other metals treated by the system. The site had a chromium reduction system that EPA did not sample; however, based on data for hexavalent chromium in the chemical precipitation system, EPA determined that the chromium reduction system was not operating optimally during the sampling episode. EPA assigned a “V” flag to the chromium data for this chemical precipitation system.

- EPA identified a chemical precipitation system where the effluent concentrations of nickel were elevated compared to other metals treated.

EPA sampled this system during two sampling episodes. The elevated nickel concentrations indicated that the batch chelation-breaking system for electroless nickel rinses may not have been operating optimally. The site combined the electroless nickel treatment sludges with other wastewater prior to chemical precipitation. The liquid fraction of the sludge likely contained chelated nickel, which then entered the chemical precipitation system and could not be efficiently precipitated. EPA assigned a "V" flag to all nickel effluent data for this treatment unit for two sampling episodes.

- EPA identified a cyanide destruction system where cyanide samples could not be preserved until the end of the compositing period. Because some degradation of cyanide may have occurred during this time, actual values for cyanide may be higher than the measured value; therefore, EPA could not accurately evaluate the data. EPA assigned a "V" flag to all cyanide effluent data for this system during the sampling episode.

- EPA identified a cyanide destruction system where the concentration of cyanide and metals in the effluent were very high and comparable to those seen in the influent to treatment systems. The data indicate that the effluent samples may have been collected at an incorrect location so the data could not be evaluated for this sampling episode. EPA assigned a "V" flag to all cyanide effluent data for this system during the sampling episode.

- EPA identified a chemical oil-emulsion breaking system where site personnel did not add oil-emulsion breaking polymer on one sampling day. On this day, the concentration of oil and grease, total petroleum hydrocarbons, and total suspended solids was higher in the effluent than on the other sampling days, indicating that omission of the polymer may have affected treatment on that day. EPA assigned a "V" flag to oil and grease, total petroleum hydrocarbons, and total suspended solids effluent data for that sampling day.

- EPA identified an ultrafiltration system where the concentration of chromium in the influent was significantly higher on one sampling day than on the other days, and the concentration increased across the system. These data indicated that the site had an unintended discharge of chromium to the treatment system on that day at concentrations that were too high for the system to effectively treat. EPA assigned a "V" flag to the chromium data for the effluent on this sampling day.

10.2.4 Identification of Wastewater Treatment Chemicals

EPA identified wastewater treatment chemicals used in each of the sampled treatment systems. EPA assigned a flag of "G" to the treatment chemicals if they did not have removals comparable to other metals on site, indicating a well-designed and well-operated system. EPA assigned this flag to 194 effluent data points. Treatment chemicals typically flagged included sodium, magnesium, aluminum, iron, and calcium. EPA flagged total dissolved solids along with specific treatment chemicals, because the total dissolved solids concentration generally increases as a result of treatment chemical addition.

10.3 Development of Long-Term Averages and Variability Factors

EPA used all unflagged data in the LTA Database to calculate the LTA concentrations and variability factors that are the basis for the proposed effluent limitations and standards. EPA calculated LTAs and variability factors from actual concentrations of constituents measured in MP&M wastewater and treated by MP&M end-of-pipe technology options (see Section 10.2). As described in Section 10.1, EPA sampling, industry trade association sampling, and sanitation district sampling episodes at MP&M facilities provided the data sets of daily effluent concentrations. The following sections discuss development of LTAs and variability factors (VFs).

For each sampling episode, EPA calculated LTAs for all pollutants that had at least one sample that passed the data editing review (Section 10.2). The Agency calculated the LTA for each pollutant as the arithmetic average of the daily concentration values. For samples where a pollutant was not detected in a sample, EPA used the sample detection limit to calculate the LTA. EPA calculated the LTA for each pollutant for each subcategory by taking the median value of the sampling episode LTAs for those episodes within each subcategory. EPA transferred effluent data from one subcategory to another subcategory when sufficient data were not available to calculate the limit for a specific pollutant within the original subcategory.

As discussed in Section 7.0, EPA is proposing a limitation for a Total Organics Parameter (TOP). Table 10-7 lists the priority and nonconventional organics that are included as part of this parameter. Section 10.4 presents EPA's methodology for calculating the proposed TOP limitations. Table 10-8A presents LTAs and VFs for total and amenable cyanide for all options for the applicable subcategories. Tables 10-8B through 10-8K show LTAs and VFs for each pollutant for each technology option in each subcategory. Tables 10-9A through 10-9J list the LTAs, VFs, and limitations for each subcategory.

10.3.1 Derivation of the Proposed Limitations

The limitations and standards are the result of multiplying the LTAs by the appropriate variability factors. The same basic procedures apply to the calculation of all limitations and standards for this industry, regardless of whether the technology is BPT, BCT, BAT, NSPS, PSES or PSNS.

The limitations for pollutants for each option are provided as 'daily maximums' and 'maximums for monthly averages.' Definitions provided in 40 CFR 122.2 state that the daily maximum limitation is the "highest allowable 'daily discharge'" and the maximum for monthly average limitation (also referred to as the "monthly average limitation") is the "highest allowable average of 'daily discharges' over a calendar month, calculated as the sum of all 'daily discharges' measured during a calendar month divided by the number of 'daily discharges' measured during that month." EPA defines daily discharges as the "'discharge of a pollutant' measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of samplings."

EPA calculates the limitations based upon percentiles that reflect both the variability within control of the facility and a level of performance consistent with the Clean Water Act requirement that these effluent limitations be based on the "best" technologies. The daily maximum limitation is an estimate of the 99th percentile of the distribution of the *daily* measurements. The monthly average limitation is an estimate of the 95th percentile of the distribution of the *monthly* averages of the daily measurements.

In establishing daily maximum limitations, EPA's objective is to restrict the discharges on a daily basis at a level that is achievable for a facility that targets its (well-operated and well designed) treatment at the long-term average. EPA acknowledges that variability around the long-term average results from normal operations. This variability means that occasionally facilities may discharge at a level that is greater than the long-term average. This variability also means that facilities may occasionally discharge at a level that is considerably lower than the long-term average. To allow for these possibly higher daily discharges, EPA has established the daily maximum limitation. A facility that discharges consistently at a level near the daily maximum limitation would <u>not</u> be operating its treatment to achieve the long-term average which is part of EPA's objective in establishing the daily maximum limitations.

In establishing monthly average limitations, EPA's objective is to provide an additional restriction that supports EPA's objective of having facilities target their average discharges to achieve the long-term average. The monthly average limitation requires continuous dischargers to provide on-going control, on a monthly basis, that complements controls imposed by the daily maximum limitation. To meet the monthly average limitation, a facility must counterbalance a value near the daily maximum limitation with one or more values well below the daily maximum limitation. To achieve compliance, these values must result in a monthly average value at or below the monthly average limitation.

In the first of two steps in estimating both types of limitations, EPA determines an average performance level (the "long-term average" discussed in Section 10.3.4) that a facility with well-designed and operated model technologies (which reflect the appropriate level of control) is capable of achieving. This long-term average is calculated from the data from the facilities using the model technologies for the option. EPA expects that all facilities subject to the limitations will design and operate their treatment systems to achieve the long-term average performance level on a consistent basis because facilities with well-designed and operated model technologies have demonstrated that this can be done.

In the second step of developing a limitation, EPA determines an allowance for the variation in pollutant concentrations when processed through extensive and well designed treatment systems. This allowance for variance incorporates all components of variability including treatment process sampling and analytical variability. This allowance is incorporated into the limitations through the use of the variability factors (discussed in Section 10.3.5) which are calculated from the data from the facilities using the model technologies. If a facility operates its treatment system to meet the relevant long-term average, EPA expects the facility to be able to meet the limitations. Variability factors assure that normal fluctuations in a facility's treatment are accounted for in the limitations. By accounting for these reasonable excursions above the long-term average, EPA's use of variability factors results in limitations that are generally well above the actual long-term averages.

Tables 10-9A through 10-9J present the limitations.

10.3.2 Steps Used to Derive Concentration-Based Limitations

The derivation of the concentration-based daily and monthly maximum limitations uses the pollutant-specific LTAs and respective VFs. The following steps are used to derive the concentration-based limitations.

Step 1: Calculate the facility-specific LTAs and 1-day and 4-day VFs for all facilities. Calculation of VFs is performed when the facility has four or more observations with two or more distinct detected values.

Step 2: For each option in the subcategory, calculate the median of the facility-specific LTAs and the mean of the facility-specific 1-day and 4-day VFs to provide pollutant-specific LTAs and 1-day and 4-day VFs.

Step 3: Calculate the daily limitations for a pollutant using the product of the pollutant-specific LTA and the pollutant-specific 1-day VF. Calculate monthly average limitations using the product of the pollutant-specific LTA and the pollutant-specific 4-day VF.

10.3.3 Modified Delta-Lognormal Model

EPA selected the modified delta-lognormal distribution to model pollutant effluent concentrations from the MP&M industry in developing the variability factors. A typical effluent data set from a facility in this industry consists of a mixture of measured (detected) and nondetected values. Within a data set, gaps between the values of detected measurements and the sample-specific detection limits associated with nondetected measurements may indicate that different pollutants were present in the different industrial wastes treated by a facility.

Nondetected measurements may indicate that the pollutant is not generated by a particular source or industrial process. The modified delta-lognormal distribution is appropriate for such data sets because it models the data as a mixture of measurements that follow a lognormal distribution and nondetect measurements that occur with a certain probability. The generalized form of the model also allows for the possibility that nondetect measurements occur at multiple sample- specific detection limits. Because the data appear to fit the modified delta-lognormal model reasonably well, EPA believes this model is an appropriate model for the MP&M industry data.

The modified delta-lognormal distribution is a modification of the ‘delta distribution’ originally developed by Aitchison and Brown[1]. The resulting mixed distributional model, which combines a continuous density portion with a discrete-valued spike at zero, is also known as the delta-lognormal distribution. The delta in the name refers to the proportion of the overall distribution contained in the discrete distributional spike at zero, that is, the proportion of zero amounts. The remaining non-zero, non-censored (NC) values are grouped together and fit to a lognormal distribution.

EPA modified this delta-lognormal distribution to incorporate multiple detection limits. In the modification of the delta portion, the single spike located at zero is replaced by a discrete distribution made up of multiple spikes. Each spike in this modification is associated with a distinct sample-specific detection limit associated with nondetected (ND) measurements in the database. A lognormal density is used to represent the set of measured values. Figure 10-2 shows this modification of the delta-lognormal distribution.

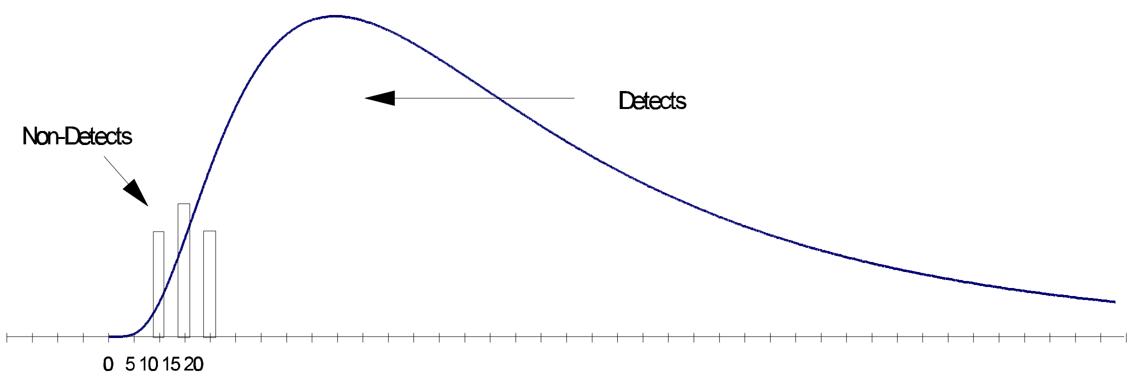

Figure 10-2. Modified Delta-Lognormal Model

In the modified model, * represents the proportion of NDs, but is divided into the sum of smaller fractions, $*_i$, each representing the proportion of NDs associated with a particular and distinct detection limit. Thus it is written as

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[1]Aitchison, J. and Brown, J.A.C. (1963) The Lognormal Distribution. Cambridge University Press, pages 87-99.

$$\delta = \sum_i (\delta_i). \tag{10-1}$$

If D_i equals the value of the i^{th} smallest distinct detection limit in the data set, and the random variable X_D represents a randomly chosen ND sample, then the discrete distribution portion of the modified delta-lognormal model is mathematically expressed as

$$Pr(X_D \le x) = \sum_{i:D_i \le x} \delta_i. \tag{10-2}$$

EPA uses the following formulas to calculate the mean and variance of this discrete distribution:

$$E(X_D) = \frac{1}{\delta}\sum_i \delta_i D_i \quad and \quad Var(X_D) = \frac{1}{\delta^2}\sum_{i}\sum_{i<j} \sum_j \delta_i \delta_j (D_j - D_i)^2. \tag{10-3}$$

10.3.4 Estimation Under the Modified Delta-Lognormal Model

A wide variety of observed effluent data sets fit the modified model. The model also handles multiple detection limits for NDs. The same basic framework is used even if there are no ND values or censored data.

U is the modified delta lognormal random variable which combines the discrete portion of the model with the continuous portion. The following equation expresses the cumulative probability distribution of the modified delta-lognormal model, where D_k denotes the largest distinct detection limit observed among the NDs and the first summation is taken over all those values, D_i, that are less than u.

$$Pr(U \le u) = \begin{cases} \sum_{i:D_i<u} \delta_i + (1-\delta)\Phi\left[(\log(u)-\mu)/\sigma\right] & if \quad u<D_k \\ \delta + (1-\delta)\Phi\left[(\log(u)-\mu)/\sigma\right] & if \quad u \ge D_k \end{cases} \tag{10-4}$$

Again combining the discrete and continuous portions of the modified model, the expected value of the random variable U is derived as a weighted sum of the expected values of the discrete and continuous lognormal portions of the distribution. This follows because the modified delta-lognormal random variable U is expressed again as a combination of three other independent variables, that is,

$$U = I_u X_D + (1 - I_u) X_C \tag{10-5}$$

where this time X_D represents a random ND from the discrete portion of the model, X_C represents a random detected measurement from the continuous lognormal portion, and I_u is an indicator variable signaling whether any particular random measurement is detected or not. Then the expected value and variance of U have the form

$$E(U) = \sum_i \delta_i D_i + (1 - \delta)\exp(\mu + 0.5\sigma^2) \tag{10-6}$$

$$\begin{aligned} Var(U) = {} & \frac{\sum_i \sum_{i<j} \delta_i \delta_j (D_i - D_j)^2}{\delta} + (1 - \delta)\exp(2\mu + \sigma^2)(\exp(\sigma^2) - 1) \\ & + \delta(1 - \delta)\left[\frac{\sum_i \delta_i D_i}{\delta} - \exp(\mu + 0.5\sigma^2)\right]^2 \end{aligned} \tag{10-7}$$

where

D_i = detection limit for the i^{th} smallest ND value
D_j = detection limit for the j^{th} smallest ND value, where $i < j$
δ_i = proportion of NDs with detection limit = D_i
δ_j = proportion of NDs with detection limit = D_j
δ = proportion of all NDs
μ = mean log concentrations of NC values
σ = standard deviation of log NC values.

10.3.5 Estimation of LTAs and VFs (Data Groups)

To estimate facility-specific long-term averages (LTAs) and variability factors (VFs), EPA divided the MP&M data sets into two groups based on their size (number of samples) and the type of samples in the subset because the computations differ for each group. EPA defined the groups as follows:

Group 1: Less than 2 NC (detectable) samples or less than 4 total samples at a facility. Specifically, Group 1 contains all data subsets with all NDs or only one detect. Sample-specific detection limits are substituted as the values associated with nondetected pollutants.

Group 2: Two or more NC (detectable) samples and 4 or more total samples. Sample-specific detection limits are substituted as the values associated with nondetected pollutants.

10.3.6 Estimation of LTAs

EPA first calculated facility-specific LTAs as the arithmetic average of the samples using data from Groups 1 and 2. EPA then derived pollutant-specific LTAs from the facility-specific LTAs. Pollutant-specific LTAs provide one concentration for a specific pollutant for all facilities within a subcategory and option.

Within each subcategory and option combination, EPA calculated pollutant-specific LTAs as the median of the facility-specific LTAs for that pollutant. The median is the midpoint of the values ordered (i.e., ranked) from smallest to largest. If there is an odd number of values (with n=number of values), then the value of the (n+1)/2 ordered observation is the median. If there is an even number of values, then the two values of the n/2 and [(n/2)+1] ordered observations are arithmetically averaged to obtain the median value.

10.3.7 Estimation of VFs

EPA developed 1-day and 4-day facility-specific VFs for all regulated pollutants using Group 2 data only. EPA did not use Group 1 data to estimate VFs because the data were insufficient for estimating variability using the modified delta-lognormal methodology.

For Group 2, EPA calculated the parameters for the lognormal portion of the data using maximum likelihood estimation in the log-domain. Upper percentiles and VFs are calculated using these estimated parameters. Calculation of these VFs is described in Section 10.3.7.1 and 10.3.7.2.

10.3.7.1 Estimation of 1-day VFs

The 1-day facility-specific VFs are a function of the facility-specific LTA and the 99th percentile. The 99th percentile of each data subset is calculated using the modified delta-lognormal methodology by first defining D_0=0, $*_0$=0, and $D_{k+1} = 4$ as boundary conditions, where D_i equals the ith smallest detection limit, and $*_i$ is the associated proportion of NDs at the ith detection limit. A cumulative distribution function, p, for each data subset is computed as a function ranging from 0 to 1. The general form for p, for a given value c, is

$$p = P(U \le c) = \sum_{i=0}^{m} \hat{\delta}_i + (1 - \hat{\delta})\, \Phi\left[\frac{\log(c) - \hat{\mu}}{\hat{\sigma}}\right], \quad D_m \le c < D_{m+1},\ m=0,1,...k \qquad \textbf{(10-8)}$$

where

$$\hat{\mu} = \frac{\sum_{i=1}^{n} \ln(x_i)}{n}, \qquad \textbf{(10-9)}$$

$$\hat{\sigma}^2 = \frac{1}{n-1} \sum_{i=1}^{n} \left(\ln(x_i) - \hat{\mu} \right)^2 , \tag{10-10}$$

and Φ is the standard normal cumulative distribution function. EPA calculated the estimated 99th percentile of each data subset as follows:

1. k values of p at $c=D_m$, m=1,...k are computed and labeled p_m.

2. The smallest value of m, such that $p_m \geq 0.99$, is determined and labeled as p_j. If no such m exists, steps 3 and 4 are skipped and step 5 is computed instead.

3. $p^* = p_j - \delta_j$ is computed.

4. If $p^* < 0.99$, then $P_{99} = D_j$,
   else if $p^* \geq 0.99$, then

$$\hat{P}_{99} = \exp\left[\hat{\mu} + \Phi^{-1}\left[\frac{\left(0.99 - \sum_{i=0}^{j-1} \hat{\delta}_i \right)}{(1-\hat{\delta})} \right] \hat{\sigma} \right]. \tag{10-11}$$

5. If no such m exists, such that $p_m \geq 0.99$ (m=1,...k), then

$$\hat{P}_{99} = \exp\left[\hat{\mu} + \Phi^{-1}\left[\frac{0.99 - \hat{\delta}}{(1-\hat{\delta})} \right] \hat{\sigma} \right]. \tag{10-12}$$

The daily VF, VF1, is then calculated as

$$VF1 = \frac{\hat{P}_{99}}{\hat{E}(U)} \tag{10-13}$$

where

$$\hat{E}(U) = \sum_i \hat{\delta}_i D_i + (1-\hat{\delta}) \exp(\hat{\mu} + 0.5\,\hat{\sigma}^2).$$

A pollutant-specific 1-day VF is the mean of the facility-specific daily VFs for that pollutant in the subcategory and option combination.

10.3.7.2 Estimation of 4-day VFs

EPA calculated a facility-specific VF for monthly averages based on the distribution of 4-day averages. To calculate the 4-day facility-specific VF, EPA assumed that the approximating distribution of $\hat{a}_4$, the sample mean for a random sample of four independent concentration values, also is derived from this modified delta-lognormal distribution with the same mean as the distribution of the concentration values. The mean of this distribution of 4-day averages is

$$E(\bar{U}_4) \;=\; \delta_4 E(\bar{X}_4)_D \;+\; (1-\delta_4)E(\bar{X}_4)_C \tag{10-14}$$

where $E(X_4)_D$ denotes the mean of the discrete portion of the distribution of the average of four independent concentration values (i.e., when all observations are not detected), and $E(X_4)_C$ denotes the mean of the continuous lognormal portion of the distribution.

First, EPA assumed that the probability of nondetection (*) on each of the four days is independent of that on the other days, and the nondetected values are therefore not correlated; consequently, $*_4 = *^4$. Also, because

$$E(\bar{X}_4)_D \;=\; E(X_D)$$

then

$$E(\bar{U}_4) \;=\; \delta^4 \sum_{i=1}^{k} \frac{\delta_i D_i}{\delta} \;+\; (1-\delta^4)\exp(\mu_4 + 0.5\sigma^2{}_4) \tag{10-15}$$

and since $E(\hat{a}_4) = E(U)$, then

$$\mu_4 \;=\; \log\left[\frac{E(U) - \delta^3 \sum_{i=1}^{k} \delta_i D_i}{(1-\delta^4)}\right] - 0.5\sigma^2{}_4. \tag{10-16}$$

The expression for $F^2{}_4$ is derived from the following relationship:

$$Var(\bar{U}_4) \;=\; \delta_4 Var((\bar{X}_4)_D) \;+\; (1-\delta_4)Var((\bar{X}_4)_C) \;+\; \delta_4(1-\delta_4)[E(\bar{X}_4)_D - E(\bar{X}_4)_C]^2. \tag{10-17}$$

Because

$$Var((\bar{X}_4)_D) = \frac{Var(X_D)}{4}, \quad E(\bar{X}_4)_D = E(X_D), \quad and \quad \delta_4 = \delta^4 \tag{10-18}$$

then

$$Var(\bar{U}_4) = \delta^4 \frac{Var(X_D)}{4} + (1-\delta^4) Var((\bar{X}_4)_C) + \delta^4(1-\delta^4)[E(X_D) - E(\bar{X}_4)_C]^2. \qquad \textbf{(10-19)}$$

This further simplifies to

$$Var(\bar{U}_4) = \frac{\delta^4 \sum_{i=1}^{k} \sum_{\substack{j=1 \\ i<j}}^{k} \delta_i \delta_j (D_i - D_j)^2}{4\delta^2} + (1-\delta^4)\exp(2\mu_4 + \sigma^2{}_4)\left[\exp(\sigma^2{}_4) - 1\right]$$
$$+ \delta^4(1-\delta^4)\left[\sum_{i=1}^{k} \frac{\delta_i D_i}{\delta} - \exp(\mu_4 + 0.5\sigma^2{}_4)\right]^2 \qquad \textbf{(10-20)}$$

and furthermore,

$$\exp(\sigma^2{}_4) - 1 = \frac{\left[Var(\bar{U}_4) - \frac{\delta^2 \sum_{i=1}^{k} \sum_{\substack{j=1 \\ i<j}}^{k} \delta_i \delta_j (D_i - D_j)^2}{4} - \delta^2(1-\delta^4)\left[\sum_{i=1}^{k} \delta_i D_i - \delta \exp(\mu_4 + 0.5\sigma^2{}_4)\right]^2\right]}{(1-\delta^4)\exp(2\mu_4 + \sigma^2{}_4)}.$$

(10-21)

Then, from (10-15) above,

$$\exp(\mu_4 + 0.5\sigma^2{}_4) = \frac{(E(\bar{U}_4) - \delta^3 \sum_{i=1}^{k} \delta_i D_i)}{(1-\delta^4)} = \frac{(E(U) - \delta^3 \sum_{i=1}^{k} \delta_i D_i)}{(1-\delta^4)}, \quad \text{because } E(\bar{U}_4) = E(U \qquad \textbf{(10-22)}$$

and letting

$$\eta = E(U) - \delta^3 \sum_{i=1}^{k} \delta_i D_i, \qquad \text{then,} \quad \exp(\mu_4 + 0.5\sigma^2{}_4) = \frac{\eta}{(1-\delta^4)}. \qquad \textbf{(10-23)}$$

Furthermore,

$$\sigma^2{}_4 = \log\left[1 + \frac{\left[Var(\bar{U}_4) - \frac{\delta^2 \sum_{i=1}^{k} \sum_{\substack{j=1 \\ i<j}}^{k} \delta_i \delta_j (D_i - D_j)^2}{4} - \delta^2(1-\delta^4)\left(\sum_{i=1}^{k} \delta_i D_i - \frac{\delta\,\eta}{(1-\delta^4)}\right)^2\right]}{\frac{(1-\delta^4)\eta^2}{(1-\delta^4)^2}}\right]. \qquad \textbf{(10-24)}$$

Since Var(â $_4$) = Var(U)/4, then, by rearranging terms,

$$\sigma^2_4 = \log\left[1 + \frac{(1-\delta^4)\,Var(U)}{4\eta^2} - \frac{(1-\delta^4)\,\delta^2 \sum_{i=1}^{k} \sum_{\substack{j=1 \\ i<j}}^{k} \delta_i \delta_j (D_i - D_j)^2}{4\eta^2} - \frac{\delta^2 \left[\sum_{i=1}^{k} \delta_i D_i (1-\delta^4) - \delta\,\eta\right]^2}{\eta^2}\right].$$

(10-25)

Thus, estimates of $:_4$ and F_4 are derived by using estimates of $*_1$,...$*_k$ (sample proportion of NDs at observed detection limits D_1,...D_k), : (maximum likelihood estimate (MLE) of logged values), and F^2 (MLE logvariance multiplied by $\frac{n}{n-1}$ to reflect estimation from sample) in the equations above.

To find the estimated 95th percentile of the average of four observations, four NDs, not all at the same detection limit, an average is generated that is not necessarily equal to D_1, D_2,..., or D_k. Consequently, more than k discrete points exist in the distribution of the 4-day averages. For example, the average of four NDs at k=2 detection limits are at the following discrete points with the associated probabilities:

i	D^*_i	δ^*_i
1	D_1	$\delta_1^{\,4}$
2	$(3D_1 + D_2)/4$	$4\delta_1^{\,3}\delta_2$
3	$(2D_1 + 2D_2)/4$	$6\delta_1^{\,2}\delta_2^{\,2}$
4	$(D_1 + 3D_2)/4$	$4\delta_1\delta_2^{\,3}$
5	D_2	$\delta_2^{\,4}$

In general, when all four observations are not detected, and when k detection limits exist, the multinomial distribution is used to determine associated probabilities; that is,

$$Pr\left[\bar{U}_4 = \frac{\sum_{i=1}^{k} u_i D_i}{4}\right] = \frac{4!}{u_1!\,u_2!\ldots u_k!} \prod_{i=1}^{k} \delta_i^{\,u_i}. \qquad \textbf{(10-26)}$$

where u_i is the number of nondetected measurements in the data set with the D_i detection limit. The number of possible discrete points, k^*, for k=1,2,3,4, and 5 are given below:

k	k^*
1	1
2	5
3	15
4	35
5	70

To find the estimated 95th percentile of the distribution of the average of four observations, the same basic steps (described in Section 10.3.7.1) as used for the 99th percentile of the distribution of daily observations are followed, with the following changes:

1. Change P_{99} to P_{95}, and 0.99 to 0.95.
2. Change D_m to D_m^*, the weighted averages of the detection limits.
3. Change $*_i$ to $*_i^*$.
4. Change k to k^*, the number of possible discrete points based on k detection limits.
5. Change the estimates of $*$, $:$, and F to estimates of $*^4$, $:_4$, and F_4, respectively.

Then, the estimate of the 95th percentile 4-day facility-specific mean VF is:

$$VF4 = \frac{\hat{P}_{95}}{\hat{E}(U)}. \tag{10-27}$$

A pollutant-specific 4-day VF is the mean of the facility-specific 4-day VFs for that pollutant in the subcategory and option combination.

10.4 Methodology for Development of TOP Long-Term Averages and Variability Factors

EPA used the following steps to calculate the LTAs and VFs for the Total Organic Parameter:

C Determine the LTA for each organic component;
C Sum the component LTAs;
C Multiply the total LTA by the mean VF across the individual organic components; and
C Add the sum of nominal quantitation limits for top pollutants that are not in the LTA database.

Table 10-7 lists the nominal quantitation values for all of the TOP pollutants and indicates which TOP pollutants EPA had sufficient data for in its LTA database to calculate an LTA. For those without data in the LTA database, EPA used the nominal quantitation limit in calculating the TOP limits. See the Statistical Support Document for Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Industry for more information on the statistical procedures used to develop the TOP limitations.

Table 10-1

Number of Evaluated Treatment Systems for Each Subcategory

MP&M End-of-Pipe Technology Option	Number of Treatment Units
Cyanide destruction (applies to all subcategories where cyanide is a regulated pollutant)	13
General Metals Subcategory	
Chemical precipitation and clarification using sedimentation (Option 2)	29
Chemical precipitation and clarification using membrane filtration (Option 4)	4
Metal Finishing Job Shop Subcategory	
Chemical precipitation and clarification using sedimentation (Option 2)	6
Printed Wiring Boards Subcategory	
Chemical precipitation and clarification using sedimentation (Option 2)	2
Chemical precipitation and clarification using membrane filtration (Option 4)	1
Shipbuilding Drydock Subcategory	
DAF	3
Oily Wastes Subcategory	
Chemical emulsion breaking and oil-water separation (Option 2)	5
Railroad Line Maintenance Subcategory	
DAF (Option 2)	1
Nonchromium Anodizing Subcategory	
Chemical precipitation and clarification using sedimentation (Option 2)	2

Source: MP&M LTA Database.

Table 10-2

Influent and Effluent Data Points from EPA Sampling Episodes

MP&M End-of-Pipe Technology Option	Number of Sites[a]	Number of Sampling Episodes[a]	Number of Treatment Units	Number of Data Points[b]
Chemical precipitation and clarification using sedimentation	39	42	42	62,892
Chemical precipitation and clarification using membrane filtration	5	5	5	12,824
Ultrafiltration	15	15	16	28,150
DAF	2	3	2	4,872
Chemical emulsion breaking and oil-water separation	5	5	5	11,926
Cyanide destruction	17	19	17	218
Total	53	57	87	120,882

[a]EPA conducted multiple sampling episodes at some sites and sampled multiple treatment units at some sites; therefore, the total does not equal the sum of a column.
[b]The database contains 137,823 influent and effluent data points from EPA sampling episodes. For cyanide destruction, EPA included only data points for amenable and total cyanide in the LTA analysis (to calculate LTAs, the Agency did not use 16,843 data points associated with analytes other than cyanide across cyanide destruction treatment units). EPA used data points for organic, metal, conventional, and nonconventional pollutants in the LTA analysis for treatment units other than cyanide destruction; however, it did not include cyanide (total and amenable) in the analysis for these other treatment units (98 data points associated with cyanide data across treatment units not designed for cyanide destruction were not evaluated).
Source: MP&M LTA Database.

Table 10-3

Influent and Effluent Data Points from Industry and Local Sanitation District Sampling Episodes

MP&M End-of-Pipe Technology Option	Number of Sites[a]	Number of Sampling Episodes[a]	Number of Treatment Units	Number of Data Points[b]
Chemical precipitation and clarification using sedimentation	3	4	3	1,752
DAF	2	2	2	2,759
Cyanide destruction	4	5	4	83
Total	5	6	9	4,594

[a]Sanitation districts conducted multiple episodes at some sites and sampled multiple treatment units at some sites; therefore, the total does not equal the sum of a column.
[b]The database contains 6,616 influent and effluent data points from industry and local sanitation district sampling. For cyanide destruction, EPA included only data points for amenable and total cyanide in the LTA analysis; therefore, to calculate LTAs, it did not use 2,022 data points associated with analytes other than cyanide cross cyanide destruction treatment units. EPA used data points for organic, metal, conventional, and nonconventional pollutants in the LTA analysis for all treatment units other than cyanide destruction; however, it did not include cyanide (total and amenable) in the analysis for these other treatment units.
Source: MP&M LTA Database.

Table 10-4

Industry-Supplied Effluent Monitoring Data

Treatment Type	Number of Sites	Number of Treatment Units	Number of Effluent Data Points
Chemical precipitation and clarification using sedimentation	5	5	2,505
Chemical precipitation and clarification using membrane filtration	3	3	708
Ultrafiltration	2	2	393
DAF for oily waste streams	2	2	439
Chemical oil-emulsion breaking	1	1	355
Cyanide destruction	3	3	109

Source: MP&M LTA Database.

Table 10-5

Number of Effluent Data Points Flagged for Each MP&M Technology Option

MP&M End-of-Pipe Technology Option	Number of Effluent Data Points Evaluated [a]	Number of Flagged Effluent Data Points												Number of Unflagged Effluent Data Points
		N	C	F	LC	LA	1	2	O	P	A	V	G	
Chemical Precipitation with Membrane Filtration	2,856	2,061	453	10	35	12	0	0	0	0	10	0	55	220
Chemical Precipitation with Sedimentation	15,743	9,091	3,665	36	259	0	147	109	33	155	178	40	309	1,721
Cyanide Destruction	151	2	19	0	4	0	0	5	1	10	1	13	0	96
Ultrafiltration	6,442	3,828	1,044	8	163	35	0	0	0	0	0	1	0	1,363
Chemical Emulsion Breaking and Oil/Water Separation	2,626	1,492	519	25	51	0	0	8	0	0	14	3	47	475
DAF	1,754	1,013	444	6	25	10	0	0	0	0	0	0	29	227
Total	29,572	17,487	6,144	85	537	57	147	122	34	165	203	57	440	4,102

[a] EPA only evaluated data for pollutants of concern. Data for cyanide destruction units are for amenable and total cyanide only. Data points for treatment units (other than cyanide destruction) are for priority metals and organics, nonconventional metals and organics, and conventional and nonconventional pollutant parameters, and exclude cyanide data. Section 7.0 lists the pollutants of concern.

Table 10-6A

MP&M Technology Effectiveness Concentrations for Total and Amenable Cyanide Destruction[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Total Cyanide										
4274	CBI	CBI	CBI	CBI	CBI	0.01	0.01	0.01	---	---
4279	9.9	7.6	11.0	50.0	48.0	0.01	0.01	0.01	0.01	0.01
4384	CBI	CBI	CBI	CBI	CBI	0.99	0.69	0.76	0.94	0.46
4460A	---	21.1	---	---	---	---	0.02	---	---	---
4807	---	0.077	47.8	4.25	0.094	0.021	0.028	0.047	0.020	0.020
4817	345	368	371	394	---	0.58	0.81	0.20	0.61	0.02
4828	---	---	8.64	17.9	2.99	0.062	0.180	0.092	0.076	0.049
4834	CBI	CBI	CBI	CBI	CBI	0.02	0.02	0.02	0.02	0.02
4847	0.024	2.3	0.026	0.01	3.22	---	0.019	0.010	0.010	0.010
4891	CBI	CBI	CBI	CBI	CBI	0.056	0.110	0.044	0.071	0.160
4904	6.33	12.70	6.80	10.90	7.29	0.175	0.117	0.325	0.309	0.359
6048	7.38	9.72	6.59	5.14	10.40	0.17	0.30	0.19	0.17	0.20
6186	97.7	66.2	69.0	75.3	102.0	0.13	0.20	0.21	0.24	0.20
Amenable Cyanide										
4807	---	0.077	47.7	4.25	0.02	0.02	0.02	0.02	0.02	0.02
4817	345	368	371	394	---	0.58	0.81	0.20	0.58	---
4828	---	---	8.62	17.40	2.91	0.035	0.160	0.063	0.038	0.024
4834	CBI	CBI	CBI	CBI	CBI	0.02	0.02	0.02	0.02	0.02
4847	0.01	2.21	0.03	0.01	3.15	---	0.01	0.01	0.01	0.01
4904	6.33	12.50	6.53	10.30	4.43	0.162	0.073	0.143	0.134	0.082
6048	6.96	9.21	6.13	4.87	9.60	0.02	0.037	0.005	0.005	0.014
6186	97.4	65.7	68.5	74.8	102.0	0.049	0.022	0.017	0.110	0.110

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-6B

MP&M Technology Effectiveness Concentrations for General Metals and Steel Forming and Finishing Subcategories (Option 2)[a,b]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Oil and Grease										
4737	CBI	CBI	CBI	CBI	CBI	14.4	16.5	14.1	10.0	13.0
4871	114.0	53.1	39.9	92.0	37.4	6.02	6.22	6.17	6.12	6.15
Total Suspended Solids (TSS)										
1197A	12	54	260	---	---	28.0	20.0	32.0	---	---
4011	CBI	CBI	CBI	CBI	CBI	28.0	30.0	22.0	---	---
4079	CBI	CBI	CBI	CBI	CBI	9.0	5.0	5.0	---	---
4277	320	20	11	13	16	14.0	14.0	17.0	10.0	17.0
4384	CBI	CBI	CBI	CBI	CBI	50.0	32.0	55.0	23.0	68.0
4415	---	77.1	119.0	130.6	---	---	1.0	1.0	1.0	—
4417	430	70	32	22	4	12.0	10.0	7.0	4.0	2.0
4438	410	---	---	10	11	7.0	---	---	8.0	5.0
4470	CBI	CBI	CBI	CBI	CBI	14.5	10.0	10.0	22.0	32.0
4737	CBI	CBI	CBI	CBI	CBI	20.0	14.5	35.0	12.5	38.0
4761	CBI	CBI	CBI	CBI	CBI	17.0	24.0	25.0	---	---
4762	CBI	CBI	CBI	CBI	CBI	14.0	16.0	13.0	16.0	13.0
4807	172	150	144	124	124	6.0	16.0	7.5	8.0	4.0
4811	CBI	CBI	CBI	CBI	CBI	4.0	4.0	4.0	4.0	4.0
4817	46	14	66	108	61	8.0	4.0	21.0	18.0	8.0
4833	115	150	129	244	230	6.5	7.0	17.5	5.5	5.5
4834	CBI	CBI	CBI	CBI	CBI	4	14	4	44	7
4871	724	538	193	647	258	7	8	6	4	4
4904	6230	8080	8920	7520	6240	4.5	4.0	4.0	8.5	7.5
Manganese										
4762	CBI	CBI	CBI	CBI	CBI	0.168	0.165	0.097	0.130	0.134
4807	0.446	0.358	0.469	1.60	1.31	0.030	0.047	0.040	0.071	0.061
4871	8.67	7.83	3.97	10.10	5.49	0.103	0.104	0.088	0.076	0.087
4904	3.53	6.11	5.20	5.69	4.33	0.0144	0.0209	0.0132	0.0079	0.0097

Table 10-6B (Continued)

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Molybdenum										
4806	1.15	1.15	1.27	0.592	1.16	1.44	0.639	0.501	0.665	0.371
4904	0.634	1.28	1.39	1.5	0.942	0.028	0.034	0.036	0.031	0.027
Tin										
4817	6.33	4.65	5.17	13.9	6.92	0.034	0.030	0.028	0.086	0.122
4834	CBI	CBI	CBI	CBI	CBI	0.59	0.57	0.72	1.37	0.82
Total Organic Carbon (TOC) (as indicator parameter)										
4737	CBI	CBI	CBI	CBI	CBI	75	106	71	108	71
4761	CBI	CBI	CBI	CBI	CBI	52	46	51	---	---
4762	CBI	CBI	CBI	CBI	CBI	172	180	147	182	172
4806	8.26	12.9	13.8	12.5	27.9	29.3	12.9	9.3	37.0	20.4
4807	20.2	26.3	17.4	17.3	24.1	16.2	23.6	27.4	10.2	8.91
4817	29.6	29.6	51.3	57.4	47.3	16.4	17.4	21.6	25.7	31.7
4833	26	41	73	10	22	10	12	34	10	10
4834	CBI	CBI	CBI	CBI	CBI	87.1	77.9	90.7	67.6	42
4871	174	102	149	206	124	117	87	117	91	101
4904	10	24	10	10	18	10	10	10	10	10
Cadmium										
1197A	---	1.49	0.271	---	---	---	0.08	0.06	---	---
4277	18.9	3.42	0.903	2.93	5.27	0.230	0.202	0.0779	0.140	0.219
4415	---	0.443	0.0358	0.0483	---	---	0.005	0.005	0.005	---
4460	0.068	0.347	0.141	---	---	0.021	0.049	0.035	---	---
6048	13.9	21.6	8.50	6.56	6.73	0.857	1.09	0.942	0.765	0.801
Chromium										
1197A	28.7	1.4	0.027	---	---	1.23	0.656	0.027	---	---
4011	CBI	CBI	CBI	CBI	CBI	0.756	0.726	1.13	---	---
4079	CBI	CBI	CBI	CBI	CBI	0.635	1.82	0.456	---	---
4310	CBI	CBI	CBI	CBI	CBI	0.395	1.77	4.65	---	—
4330	CBI	CBI	CBI	CBI	CBI	0.066	0.131	0.043	0.050	0.043
4384	CBI	CBI	CBI	CBI	CBI	0.593	0.603	0.785	0.411	0.532
4415	---	5.303	1.475	0.973	---	---	0.015	0.020	0.112	---
4417	5.10	3.31	3.56	2.77	1.57	0.0199	0.0133	0.0292	0.0098	0.0216

Table 10-6B (Continued)

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Chromium (continued)										
4438	28.1	---	---	17.4	19.3	0.099	---	---	0.091	0.088
4460	4.24	8.8	3.06	---	---	1.33	1.21	0.984	---	---
4470	CBI	CBI	CBI	CBI	CBI	0.0825	0.0555	0.0686	0.1083	0.0716
4811	CBI	CBI	CBI	CBI	CBI	0.008	0.008	0.008	0.010	0.009
4817	2.73	2.55	2.15	0.33	1.64	0.0576	0.314	0.0805	0.0217	0.2715
4833	8.85	19.1	18.1	62.2	37.4	0.0369	0.0281	0.0675	0.0891	0.118
4847	8.32	8.07	28.7	10.0	102	0.380	0.201	0.194	0.190	0.543
4871	1.54	0.82	0.41	1.57	0.515	0.01	0.01	0.01	0.01	0.01
4904	7.7	12.1	15.6	14.8	11.0	0.017	0.012	0.011	0.022	0.012
Copper										
4277	29.50	7.74	5.16	13.1	14.6	0.638	0.701	0.610	0.462	0.385
4737	CBI	CBI	CBI	CBI	CBI	0.507	0.235	0.022	0.040	0.073
4806	13.6	8.57	8.18	4.47	1.66	1.07	0.265	0.301	0.926	0.484
4807	29.5	27.7	23.0	22.4	23.5	1.31	1.43	1.36	0.71	0.426
4817	32.8	30.0	32.6	36.8	30.1	0.199	0.149	0.154	0.260	0.428
4833	0.402	1.48	2.91	3.70	2.63	0.110	0.127	0.098	0.131	0.175
4834	CBI	CBI	CBI	CBI	CBI	0.0519	0.0454	0.0477	0.0772	0.0796
4847	1.65	2.43	3.57	0.944	1.03	0.118	0.100	0.103	0.035	0.046
4904	157	251	251	273	224	0.037	0.040	0.031	0.049	0.073
Lead										
1197A	0.20	0.223	159	---	---	0.47	4.97	0.20	---	---
4761	CBI	CBI	CBI	CBI	CBI	0.012	0.012	0.012	---	---
4762	CBI	CBI	CBI	CBI	CBI	0.0248	0.0248	0.0248	0.0248	0.0248
4834	CBI	CBI	CBI	CBI	CBI	0.0256	0.016	0.0181	0.0186	0.0244
4871	1.47	1.95	1.04	1.80	1.12	0.0087	0.0130	0.011	0.0061	0.0083
Nickel										
1197A	0.082	6.29	0.071	---	---	0.209	1.390	1.390	---	---
4277	27.4	2.705	1.05	3.54	6.38	0.173	0.180	0.161	0.180	0.197
4438	34.2	---	---	32.4	31.7	0.378	---	---	0.518	0.348
4470	CBI	CBI	CBI	CBI	CBI	0.339	0.229	0.143	0.222	0.224
4761	CBI	CBI	CBI	CBI	CBI	0.319	0.254	0.225	---	---
4762	CBI	CBI	CBI	CBI	CBI	0.304	0.232	0.124	0.158	0.211
4807	6.56	5.73	6.67	6.90	5.95	0.287	0.354	0.319	0.220	0.138

Table 10-6B (Continued)

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
4811	CBI	CBI	CBI	CBI	CBI	0.0160	0.057	0.063	0.018	0.037
Nickel (continued)										
4817	0.209	0.329	0.721	0.944	1.38	0.0209	0.0284	0.0282	0.0472	0.0473
4833	0.507	0.651	0.724	0.864	5.02	0.192	0.016	0.016	0.016	0.016
4834	CBI	CBI	CBI	CBI	CBI	0.212	0.216	0.310	0.430	0.484
4847	0.639	0.918	2.64	1.52	0.43	0.043	0.031	0.027	0.061	0.110
4871	8.97	8.48	4.70	10.3	6.11	0.697	0.620	0.602	0.536	0.802
4904	6.60	11.4	10.8	12.4	8.99	0.026	0.026	0.026	0.026	0.026
6048	0.718	22.4	4.56	8.95	21.2	0.135	0.518	0.270	0.284	0.525
Silver										
1197A	0.005	3.2	0.029	---	---	0.559	0.430	0.029	---	---
4277	4.230	0.138	0.0165	0.121	0.303	0.005	0.005	0.010	0.005	0.027
4807	0.999	1.670	1.010	0.683	0.923	0.0202	0.0472	0.0701	0.0006	0.0218
4817	0.910	0.793	1.040	0.946	0.548	0.0160	0.0782	0.051	0.0613	0.1025
Zinc										
1197A	---	0.153	0.062	---	---	---	0.041	0.020	---	---
4277	3.48	1.335	0.925	0.801	2.64	0.0218	0.0469	0.0416	0.0126	0.0153
4415	---	2.303	1.923	3.012	---	---	0.070	0.058	0.541	---
4417	142	66.1	45.9	4.55	19.9	0.15	0.213	0.173	0.0778	0.212
4470	CBI	CBI	CBI	CBI	CBI	1.596	0.98	1.35	1.18	1.792
4737	CBI	CBI	CBI	CBI	CBI	0.0655	0.0882	0.386	0.0557	0.0926
4761	CBI	CBI	CBI	CBI	CBI	0.136	0.140	0.2015	---	---
4762	CBI	CBI	CBI	CBI	CBI	0.269	0.175	0.173	0.163	0.224
4807	4.13	3.97	4.19	3.56	3.02	0.137	0.165	0.194	0.097	0.051
4811	CBI	CBI	CBI	CBI	CBI	0.0521	0.0556	0.0629	0.0473	0.0468
4817	57.6	55.5	30.6	51.5	23.4	0.447	0.300	0.196	0.411	0.309
4871	32	25.7	13	34.9	17.5	0.203	0.215	0.139	0.126	0.141
4904	3.91	6.21	4.62	4.21	3.03	0.015	0.018	0.015	0.015	0.015

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
[b]The Steel Forming and Finishing Subcategory has mass-based limits, which are being proposed based on the General Metals Subcategory concentration-based limits. Section 14.0 provides the mass-based limits for the Steel Forming and Finishing Subcategory and methodology for deriving the limits.
--- No samples collected on this day.
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Table 10-6C

MP&M Technology Effectiveness Concentrations for General Metals and Steel Forming and Finishing Subcategory (Option 4)[a,b]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Cadmium										
4882	3.59	4.52	3.82	3.18	1.27	0.0072	0.005	0.0056	0.0073	0.0102
Chromium										
4807	0.71	0.164	0.51	0.412	1.24	0.085	0.0154	0.0368	0.0248	0.017
4854	CBI	CBI	CBI	CBI	CBI	0.0098	0.0119	0.0170	0.0142	0.017
4882	35.3	23.0	25.4	24.1	11.0	0.0159	0.0330	0.0867	0.0954	0.468
Copper										
4807	17.2	9.71	26.6	20.7	89.8	0.127	0.0416	0.0418	0.0663	0.0929
4854	CBI	CBI	CBI	CBI	CBI	0.008	0.008	0.034	0.330	0.0394
4882	1.5	0.74	0.432	0.372	0.219	0.0660	0.0205	0.0168	0.0124	0.0126
Manganese										
4807	4.78	1.16	4.19	1.51	5.95	0.117	0.132	0.162	0.171	0.067
Nickel										
4807	29.0	5.06	12.3	6.94	30.9	1.58	0.48	0.55	0.54	0.60
4854	CBI	CBI	CBI	CBI	CBI	0.022	0.016	0.017	0.016	0.101
Silver										
4807	3.13	1.79	3.39	1.92	2.48	0.0184	0.0006	0.0331	0.0252	0.0006
Tin										
4807	0.394	1.74	2.17	0.60	1.29	0.0184	0.0184	0.0184	0.0184	0.0184
Zinc										
4807	9.01	3.01	7.91	4.39	13.4	0.0576	0.0584	0.0398	0.0452	0.0002
4854	CBI	CBI	CBI	CBI	CBI	0.008	0.017	0.020	0.008	0.008
4882	34.8	44.6	37.8	32.7	14.0	0.028	0.029	0.067	0.046	0.011
Total Suspended Solids (TSS)										
4807	3080	152	2380	380	2920	30.0	17.0	23.0	13.0	27.0
4882	33	61	76	---	22	4.5	4.0	4.0	4.0	4.0

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
[b]The Steel Forming and Finishing Subcategory has mass-based limits, which are being proposed based on the General Metals Subcategory concentration-based limits. Section 14.0 provides the mass-based limits for the Steel Forming and Finishing Subcategory and methodology for deriving the limits.
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-6D

MP&M Technology Effectiveness Concentrations for Metal Finishing Job Shops Subcategory (Option 2)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Total Suspended Solids (TSS)										
4788	175.2	97.6	86.8	103.2	708.8	13.0	21.0	12.0	6.5	9.0
6178	250.5	534	170.5	---	---	16	43	10	---	---
6187	6266.5	6307.5	8532.5	---	---	10.5	12.0	11.0	---	---
Manganese										
4278	CBI	CBI	CBI	CBI	CBI	0.181	0.166	0.115	0.172	---
4279	2.176	1.033	1.236	0.620	5.713	0.035	0.093	0.076	0.007	0.195
6178	0.5005	1.6975	1.7425	---	---	0.0127	0.0216	0.0167	---	---
6187	9.4873	17.312	47.339	---	---	0.0043	0.0036	0.0064	---	---
Tin										
4788	50.95	36.51	63.67	52.71	75.34	1.08	0.94	1.36	1.46	1.22
Total Organic Carbon (TOC) (as indicator parameter)										
4788	36.4	37.0	57.6	39.6	46.4	48.0	42.0	68.5	50.5	43.0
Cadmium										
4279	7.6391	2.6358	2.4367	1.4307	7.7302	0.0864	0.1756	0.2105	0.0222	0.1896
4788	1.3988	3.436	1.9368	2.1336	11.5484	0.0118	0.0427	0.0225	0.0105	0.0198
6178	2.9685	0.9908	1.6622	---	---	0.041	0.035	0.029	---	---
6187	63.935	117.034	322.825	---	---	0.0286	0.0707	0.0661	---	---
Chromium										
4278	CBI	CBI	CBI	CBI	CBI	0.019	0.007	0.007	0.033	---
4279	22.559	11.269	9.668	7.609	10.352	0.364	0.507	0.576	0.180	0.834
4788	5.568	8.062	13.198	11.907	10.887	0.336	0.188	0.475	0.236	0.05
4893	0.269	1.82	---	---	---	0.126	0.382	---	---	---
6178	1.084	1.82	4.365	---	---	0.141	0.282	0.626	---	---
6187	14.358	31.745	93.393	---	---	0.169	0.478	0.396	---	---
Copper										
4278	CBI	CBI	CBI	CBI	CBI	0.035	0.329	0.087	0.061	---
4279	3.663	1.8121	1.1632	0.9302	2.1929	0.0990	0.1235	0.1748	0.0344	0.0929
4883	0.998	1.160	1.06	0.645	1.04	0.176	0.596	0.358	0.407	0.304
4894	0.904	1.14	---	---	---	0.463	0.253	---	---	---

Table 10-6D (Continued)

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Copper (continued)										
6178	5.74	23.875	17.0	---	---	0.221	0.653	0.439	---	---
6187	122.18	201.475	344.128	---	---	0.420	0.208	0.277	---	---
Lead										
4788	8.314	8.074	9.726	11.084	16.168	0.165	0.127	0.152	0.244	0.196
6178	2.840	13.595	19.643	---	---	0.035	0.070	0.055	---	---
6187	36.585	72.053	74.443	---	---	0.084	0.044	0.075	---	---
Nickel										
4278	CBI	CBI	CBI	CBI	CBI	0.318	0.157	0.317	0.596	---
4279	7.141	3.847	2.619	3.537	13.153	0.477	0.481	0.363	0.058	0.527
4788	21.267	13.464	16.572	15.403	53.733	0.690	0.790	0.748	0.679	0.342
4883	2.05	0.786	3.36	1.99	0.605	0.315	0.205	0.534	0.465	0.182
4894	1.71	1.12	---	---	---	0.305	0.233	---	---	---
Silver										
4788	0.3122	0.4425	0.1738	0.2374	1.4206	0.0296	0.0296	0.0068	0.005	0.0196
6178	0.2425	1.6425	2.0275	---	---	0.035	0.010	1.080	---	---
6187	0.9715	0.8013	1.146	---	---	0.043	0.033	0.020	---	---
Zinc										
4278	CBI	CBI	CBI	CBI	CBI	0.022	0.027	0.011	0.011	---
4279	93.67	40.33	34.26	44.99	100.47	1.23	3.53	2.06	0.263	2.87
4788	1.099	2.074	1.610	1.260	4.907	0.011	0.032	0.024	0.011	0.013
4883	0.996	1.13	0.837	1.10	0.592	0.177	0.269	0.230	0.322	0.164
4893	0.292	1.67	---	---	---	0.087	0.352	---	---	---
4894	0.532	1.40	---	---	---	0.114	0.255	---	---	---
6178	1.3842	0.813	0.9343	---	---	0.0463	0.0169	0.0161	---	---
6187	19.2285	69.7393	175.9742	---	---	0.0177	0.0162	0.0221	---	—

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2). Section 14.0 provides the mass-based limits for the Steel Forming and Finishing Subcategory and methodology for deriving the limits.
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-6E

MP&M Technology Effectiveness Concentrations for Nonchromium Anodizers Subcategory (Option 2)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Total Suspended Solids (TSS)										
4856	CBI	CBI	CBI	CBI	CBI	7.0	6.0	6.0	8.0	11.0
4869	502	21	9	46	---	4.0	12.0	10.0	52.0	4.0
Aluminum										
4856	CBI	CBI	CBI	CBI	CBI	2.91	2.23	3.04	3.4	5.29
4869	132	14.8	16.1	8.24	---	1.08	0.64	1.14	4.65	0.80

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
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Table 10-6F

MP&M Technology Effectiveness Concentrations for Printed Wiring Boards Subcategory (Option 2)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Manganese										
4866	0.385	0.574	0.860	1.940	1.070	0.212	0.235	0.289	0.666	0.641
Nickel										
4866	2.5	0.499	0.325	0.449	0.279	0.121	0.148	0.091	0.107	0.090
4867	0.0388	0.029	2.30	0.372	0.505	0.017	0.016	0.126	0.019	0.067
Tin										
4866	6.74	3.89	5.07	4.11	4.92	0.051	0.141	0.082	0.097	0.229
4867	3.26	5.13	2.65	1.61	1.71	0.025	0.093	0.016	0.014	0.039
Total Organic Carbon (TOC) (as indicator parameter)										
4866	11.2	22.1	17.7	62.0	16.6	11.0	17.7	16.5	35.6	13.8
4867	87.6	152	116	86.3	108	70.7	86.1	99.7	84.4	88.4

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-6G

MP&M Technology Effectiveness Concentrations for Printed Wiring Boards Subcategory (Option 4)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Copper										
4855	19.4	48.8	38.6	16.9	33.9	0.0018	0.0018	0.0018	0.0018	0.0081
Lead										
4855	3.1	2.61	2.38	2.18	1.75	0.021	0.021	0.021	0.021	0.021
Tin										
4855	6.94	5.77	4.48	4.35	2.97	0.0403	0.0718	0.0548	0.0549	0.0517

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-6H

MP&M Technology Effectiveness Concentrations for Oily Wastes Subcategory (Option 6)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Oil and Grease (as HEM)										
4851	6883.8	16642	379.5	7569.7	334	14.9	18.3	15.4	14.2	12.1
4872	696.0	2182.5	502.0	---	---	52.0	44.8	55.6	---	---
4876	2030	2230	1760	1110	3440	25.6	24.7	105	54.7	188
4877	556.5	1937.5	996.7	544.3	469	24.0	63.75	14.75	21.25	15.0
Total Sulfide (as S)										
4877	14.0	5.0	4.0	14.0	17.0	4.5	8.0	3.0	17.0	3.0
Total Suspended Solids (TSS)										
4471	96	82	77	98	---	100	40	36	6	---
4851	1720	508	373	615	71	40	35	49	48	34
4872	244	242	165	---	---	12.5	10.0	13.0	---	---
4876	1670	833	1580	84	620	18	15	20	10	12
4877	90	275	162	303	241	17	62	26	14	21

Table 10-6H (Continued)

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Total Organic Carbon (TOC) (as indicator parameter)										
4851	1520	517	280	216	232	202.0	254.5	299.5	480.0	240.0
4872	1340	963	797	---	---	173.5	131	260	---	---
Total Organic Carbon (TOC) (as indicator parameter) - (continued)										
4876	928	1090	1690	1120	1650	493	313	1110	605	1270
4877	659	158	289	569	282	269	206.5	264	329	269

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
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Table 10-6I

MP&M Technology Effectiveness Concentrations for Railroad Line Maintenance Subcategory (Option 10)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Biochemical Oxygen Demand (BOD) 5-Day (Carbonaceous)										
6179	114	94	256	---	---	4.5	5.0	6.0	---	---
Oil and Grease (as HEM)										
6179	255.5	250.7	268	---	---	6.7	6.7	5.3	---	---
Total Suspended Solids (TSS)										
6179	122	155	339	---	---	14.5	8.5	9.0	---	---

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
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Table 10-6J

MP&M Technology Effectiveness Concentrations for Shipbuilding and Drydock Subcategory (Option 10)[a]

Episode	Daily Influent Concentration (mg/L, ppm)					Daily Effluent Concentration (mg/L, ppm)				
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 1	Day 2	Day 3	Day 4	Day 5
Oil and Grease (as HEM)										
4891	CBI	CBI	CBI	CBI	CBI	5.6	5.5	8.3	5.3	6.3
4892	180.3	206.8	595.5	661.3	1823	9.3	8.5	12.0	11.7	17.2
Total Suspended Solids (TSS)										
4805	1070	9	---	---	---	38	21	---	---	—
4891	CBI	CBI	CBI	CBI	CBI	17	11	5	18	7
4892	39	47	50	88	221	37.5	41	44.5	50	102

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
--- No samples collected on this day.
CBI - Confidential Business Information.

Table 10-7

Calculation of Total Organics Parameter (TOP) Limit

Total Organics Parameter Pollutants that are also POCs	CAS Number	Nominal Quantitation Limit (mg/L)	Pollutant has data in the LTA database for Option 2[a]
Acrolein	107-02-8	0.05	
Benzoic acid	65-85-0	0.05	x
Carbon disulfide	75-15-0	0.01	x
Dibenzofuran	132-64-9	0.01	
Dibenzothiophene	132-65-0	0.01	x
Isophorone	78-59-1	0.01	
n-Hexadecane	544-76-3	0.01	x
n-Tetradecane	929-59-4	0.01	x
Aniline	62-53-3	0.01	
Chloroform (trichloromethane)	67-66-3	0.01	x
Methylene chloride (dichloromethane)	75-09-2	0.01	
Chloroethane (ethyl chloride)	75-00-3	0.05	
1,1-Dichloroethane	75-34-3	0.01	
1,1,1-Trichloroethane (methylchloroform)	71-55-6	0.01	
1,1-Dichloroethylene (vinylidene chloride)	75-35-4	0.01	x
Tetrachloroethylene (perchloroethylene)	127-18-4	0.01	
Trichloroethylene	79-01-6	0.01	
Biphenyl	92-52-4	0.01	x
p-Cymene	99-87-6	0.01	x
Ethylbenzene	100-41-4	0.01	x
Toluene	108-88-3	0.01	x
N-Nitrosodimethylamine	62-75-9	0.05	
N-Nitrosodiphenylamine	86-30-6	0.02	
Chlorobenzene	108-90-7	0.01	
2,6-Dinitrotoluene	606-20-2	0.01	
Phenol	108-95-2	0.01	
4-Chloro-*m*-cresol (*para*chloro*meta*cresol or 4-chloro-3- methylphenol)	59-50-7	0.01	x
2,4-Dinitrophenol	51-28-5	0.05	
2,4-Dimethylphenol	105-67-9	0.01	
2-Nitrophenol (*o*-nitrophenol)	88-75-5	0.02	
4-Nitrophenol (*p*-nitrophenol)	100-02-7	0.05	

Table 10-7 (Continued)

Total Organics Parameter Pollutants that are also POCs	CAS Number	Nominal Quantitation Limit (mg/L)	Pollutant has data in the LTA database for Option 2[a]
Acenaphthene	83-32-9	0.01	x
Anthracene	120-12-7	0.01	
3,6-Dimethylphenanthrene	1576-67-6	0.01	x
Fluorene	86-73-7	0.01	x
Fluoranthene	206-44-0	0.01	
2-Isopropylnaphthalene	2027-17-0	0.01	x
1-Methylfluorene	1730-37-6	0.01	x
2-Methylnaphthalene	91-57-6	0.01	x
1-Methylphenanthrene	832-69-9	0.01	x
Naphthalene	91-20-3	0.01	x
Phenanthrene	85-01-8	0.01	x
Pyrene	129-00-0	0.01	x
Benzyl butyl phthalate	85-68-7	0.01	
Dimethyl phthalate	131-11-3	0.01	
Di-n-butyl phthalate	84-74-2	0.01	
Di-n-octyl phthalate	117-84-0	0.01	
Di(2-ethylhexyl) phthalate	117-81-7	0.01	x
Sum of nominal quantitation limits for pollutants that are not in the LTA database			0.47

[a] x indicates that the pollutant has data in the LTA database for Option 2.

Table 10-8A

Episode-Level Long-Term Averages and Variability Factors for Total and Amenable Cyanide Destruction (All Options for Applicable Subcategories)[a]

Regulated Pollutant	Subcategory	Episode	Long-Term Average Concentration (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Cyanide	General Metals	4274	0.01	---	---
	Metal Finishing Job Shop	4279	0.01	---	---
	General Metals	4384	0.77	1.94	1.27
	General Metals	4460A	0.02	---	---
	General Metals	4807	0.027	2.60	1.41
	General Metals	4817	0.443	2.18	1.60
	Metal Finishing Job Shop	4828	0.092	2.80	1.48
	General Metals	4834	0.02	---	---
	General Metals	4847	0.012	2.63	1.39
	Shipbuilding and Drydock	4891	0.088	2.92	1.51
	General Metals	4904	0.257	2.74	1.47
	General Metals	6048	0.207	1.66	1.20
	Metal Finishing Job Shop	6186	0.196	1.67	1.20
Amenable Cyanide	General Metals	4807	0.02	---	---
	General Metals	4817	0.54	1.83	1.37
	Metal Finishing Job Shop	4828	0.064	4.20	1.79
	General Metals	4834	0.020	---	---
	General Metals	4847	0.010	---	---
	General Metals	4904	0.119	2.14	1.33
	General Metals	6048	0.016	3.70	1.76
	Metal Finishing Job Shop	6186	0.0618	5.12	1.99

[a]Data used for limits for General Metals, Metal Finishing Job Shops, Printed Wiring Board, and Steel Forming and Finishing Subcategories.

Table 10-8B

Episode-Level Long-Term Averages and Variability Factors for General Metals and Steel Forming and Finishing Subcategories (Option 2) [a]

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Manganese	4762	0.139	1.64	1.20
	4807	0.050	2.08	1.31
	4871	0.092	1.35	1.11
	4904	0.013	2.22	1.35
Molybdenum	4806	0.723	2.84	1.49
	4904	0.031	1.32	1.11
Tin	4817	0.060	3.85	1.72
	4834	0.815	2.14	1.32
Total Organic Carbon (TOC) (as indicator parameter)	4737	86.5	1.61	1.19
	4761	49.7	---	---
	4762	170.6	1.22	1.07
	4806	21.8	3.20	1.57
	4807	17.3	2.80	1.48
	4817	22.6	1.82	1.24
	4833	15.2	5.15	1.95
	4834	73.1	1.97	1.28
	4871	102.6	1.37	1.12
	4904	10.0	---	---
Cadmium	1197A	0.0705	---	---
	4277	0.174	2.59	1.43
	4415	0.0052	---	---
	4460	0.0349	---	---
	6048	0.891	1.37	1.12
Chromium	1197A	0.638	---	---
	4011	0.871	---	---
	4079	0.970	---	---
	4310	2.272	---	---
	4330	0.067	2.65	1.45
	4384	0.585	1.68	1.21
	4415	0.0488	---	---

Table 10-8B (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Chromium (continued)	4417	0.0188	2.47	1.41
	4438	0.093	---	---
	4460	1.175	---	---
	4470	0.0773	1.73	1.22
	4811	0.0085	1.19	1.07
	4817	0.0925	6.02	2.19
	4833	0.0679	3.37	1.61
	4847	0.301	2.73	1.46
	4871	0.0101	---	---
	4904	0.0147	1.91	1.27
Copper	4277	0.559	1.73	1.22
	4737	0.175	8.73	2.82
	4806	0.609	3.58	1.66
	4807	1.049	2.98	1.52
	4817	0.238	2.50	1.41
	4833	0.128	1.63	1.19
	4834	0.060	1.81	1.24
	4847	0.080	3.05	1.54
	4904	0.046	2.03	1.30
Lead	1197A	1.88	---	---
	4761	0.012	---	---
	4762	0.025	---	---
	4834	0.020	1.55	1.18
	4871	0.009	1.88	1.26
Nickel	1197A	0.557	---	---
	4277	0.178	1.18	1.06
	4438	0.415	---	---
	4470	0.231	1.95	1.28
	4761	0.266	---	---
	4762	0.206	2.11	1.32
	4807	0.264	2.24	1.35
	4811	0.047	1.93	1.36
	4817	0.034	2.16	1.33
	4833	0.051	---	---
	4834	0.330	2.26	1.35
	4847	0.054	3.16	1.56
	4871	0.652	1.41	1.13
	4904	0.026	----	----
	6048	0.346	3.15	1.56

Table 10-8B (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Silver	1197A	0.339	----	---
	4277	0.010	5.89	2.13
	4807	0.032	4.02	1.84
	4817	0.062	4.08	1.76
Zinc	1197A	0.030	---	---
	4277	0.028	3.30	1.59
	4415	0.223	---	---
	4417	0.165	2.41	1.39
	4470	1.381	1.69	1.21
	4737	0.137	4.45	1.84
	4761	0.159	---	---
	4762	0.201	1.60	1.19
	4807	0.129	3.00	1.53
	4811	0.053	1.32	1.10
	4817	0.333	2.02	1.29
	4871	0.165	1.71	1.22
	4904	0.016	---	—
Oil and Grease (as HEM)	4737	13.6	1.51	1.16
	4871	6.1	---	---
Total Suspended Solids (TSS)	1197A	26.7	---	---
	4011	26.7	---	---
	4079	6.3	---	---
	4277	14.4	1.62	1.19
	4384	45.6	2.52	1.42
	4415	1.0	---	---
	4417	7.0	3.11	1.60
	4438	6.7	---	----
	4470	17.7	2.87	1.50
	4737	24.0	2.84	1.49
	4761	22.0	---	---
	4762	14.4	1.27	1.09
	4807	8.3	2.67	1.47
	4811	4.0	---	---
	4817	11.8	3.54	1.67

Table 10-8B (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Suspended Solids (TSS) (continued)	4833	8.4	2.74	1.47
	4834	14.6	7.06	2.40
	4871	5.8	2.00	1.29
	4904	5.7	2.33	1.37
Total Sulfides (as S)[c]	4877	7.1	4.25	1.80
Total Cyanide	(d)	(d)	(d)	(d)
Amenable Cyanide	(d)	(d)	(d)	(d)

[a]The Steel Forming and Finishing Subcategory has mass-based limits, which are being proposed based on the General Metals Subcategory concentration-based limits. Section 14.0 provides the mass-based limits for the Steel Forming and Finishing Subcategory and methodology for driving the limits.
[b]Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[c]Data transfer from Oily Wastes Subcategory.
[d]See Table 10-8A, Total and Amenable Cyanide.
--- Not calculated due to insufficient data.
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Table 10-8C

Episode-Level Long-Term Averages and Variability Factors for General Metals and Steel Forming and Finishing Subcategories (Option 4)[a]

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Cadmium	4882	0.007	1.81	1.25
Chromium	4807	0.036	3.95	1.74
	4854	0.014	1.69	1.21
	4882	0.140	8.61	2.80
Copper	4807	0.074	2.78	1.48
	4854	0.084	10.79	3.16
	4882	0.026	3.91	1.73
Manganese	4807	0.130	2.21	1.34
Nickel	4807	0.751	2.75	1.47
	4854	0.034	6.80	2.33
Silver	4807	0.016	2.94	1.79
Tin	4807	0.018	---	---
	4855	---	1.58[c]	1.18[c]
Zinc	4807	0.040	1.87	1.49
	4854	0.012	1.84	1.36
	4882	0.036	2.70	1.52
Total Suspended Solids (TSS)	4807	22.0	2.10	1.31
	4882	4.1	---	---
Total Organic Carbon (TOC) (as indicator parameter) [d]	4737	86.5	1.61	1.19
	4761	49.7	---	---
	4762	170.6	1.22	1.07
	4806	21.8	3.20	1.57
	4807	17.3	2.80	1.48
	4817	22.6	1.82	1.24
	4833	15.2	5.15	1.95
	4834	73.1	1.97	1.28
	4871	102.6	1.37	1.12
	4904	10.0	---	---
Lead[c]	4855	0.021	---	---
Oil and Grease (as HEM)[d]	4737	13.6	1.51	1.16
	4871	6.136	---	---
Molybdenum[d]	4806	0.723	2.84	1.49

Table 10-8C (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[b] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
	4904	0.031	1.32	1.11
Total Sulfide[e]	4877	7.1	4.25	1.80
Amenable Cyanide	(f)	(f)	(f)	(f)
Total Cyanide	(f)	(f)	(f)	(f)

[a]The Steel Forming and Finishing Subcategory has mass-based limits, which are being proposed based on the General Metals Subcategory concentration-based limits. Section 14.0 provides the mass-based limits for the Steel Forming and Finishing Subcategory and methodology for driving the limits.
[b]Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[c]Data transfer from Printed Wiring Board Subcategory Option 4.
[d]Data transfer from General Metals Subcategory Option 2.
[e]Data transfer from Oily Wastes Subcategory.
[f]See Table 10-8A, Total and Amenable Cyanide.
--- Not calculated due to insufficient data.
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Table 10-8D

Episode-Level Long-Term Averages and Variability Factors for Metal Finishing Job Shops Subcategory (Option 2)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Manganese	4278	0.158	1.58	1.18
	4279	0.081	8.27	2.71
	6178	0.017	---	---
	6187	0.005	---	---
Tin	4788	1.213	1.49	1.15
Total Organic Carbon (TOC) (as indicator parameter)	4788	50.4	1.55	1.17
Cadmium	4279	0.137	5.75	2.13
	4788	0.021	3.16	1.56
	6178	0.035	---	---
	6187	0.055	---	---
Chromium	4278	0.016	4.45	1.85
	4279	0.492	3.25	1.58
	4788	0.257	5.12	1.99
	4893	0.254	---	---
	6178	0.350	---	---
	6187	0.348	---	---
Copper	4278	0.128	5.79	2.14
	4279	0.105	3.41	1.62
	4883	0.368	2.56	1.42
	4894	0.358	---	---
	6178	0.438	---	---
	6187	0.302	---	---
Lead	4788	0.177	1.73	1.22
	6178	0.053	---	---
	6187	0.068	---	---
Silver	4788	0.0181	4.42	1.86
	6178	0.3750	---	---
	6187	0.0323	---	---

Table 10-8D (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Zinc	4278	0.0178	1.82	1.35
	4279	1.989	6.54	2.31
	4788	0.018	2.76	1.47
	4883	0.232	1.85	1.25
	4893	0.220	---	---
	4894	0.185	---	---
	6178	0.026	---	---
	6187	0.019	---	---
Molybdenum[b]	4806	0.723	2.84	1.49
	4904	0.031	1.32	1.11
Nickel	4278	0.070	4.36	1.83
	4279	0.381	5.68	2.12
	4788	0.650	2.09	1.31
	4883	0.340	2.71	1.46
	4894	0.269	---	---
Total Organic Carbon (TOC) (as indicator parameter)	4788	50.4	1.55	1.17
Total Sulfide[c]	4877	7.1	4.25	1.80
Total Cyanide	(d)	(d)	(d)	(d)
Amenable Cyanide	(d)	(d)	(d)	(d)

[a] Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[b] Data transfer from General Metals Subcategory Option 2.
[c] Data transfer from Oily Wastes Subcategory.
[d] See first table under Table 10-8A, Total and Amenable Cyanide.
--- Not calculated due to insufficient data.
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Table 10-8E

Episode-Level Long-Term Averages and Variability Factors for Metal Finishing Job Shops (Option 4)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Suspended Solids[b]	4807	22.0	2.10	1.31
	4882	4.10	---	---
Manganese[b]	4807	0.130	2.21	1.34
Tin	4807 (a)	0.018	---	---
	4855 (c)	---	1.58	1.18
Total Organic Carbon (TOC) (as indicator parameter)	4788	50.4	1.55	1.17
Cadmium	4882	0.007	1.8	1.25
Chromium[b]	4807	0.036	3.95	1.74
	4854	0.014	1.69	1.21
	4882	0.140	8.61	2.80
Copper[b]	4807	0.074	2.78	1.48
	4854	0.084	10.79	3.16
	4882	0.026	3.91	1.73
Lead[d]	4855	0.021	---	---
Silver[b]	4807	0.016	2.94	1.79
Zinc[b]	4807	0.040	1.87	1.49
	4854	0.012	1.84	1.36
	4882	0.036	2.70	1.52
Oil and Grease (as HEM)[c]	4737	13.6	1.51	1.16
	4871	6.14	---	---
Molybdenum[c]	4806	0.031	2.84	1.49
	4904	0.315	1.32	1.11
Nickel[b]	4807	0.751	2.75	1.47
	4854	0.034	6.80	2.33
Total Organic Carbon (TOC) (as indicator parameter)	4788	50.4	1.55	1.17

Table 10-8E (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Sulfide (e)	4877	7.1	4.25	1.80
Total Cyanide	(f)	(f)	(f)	(f)
Amenable Cyanide	(f)	(f)	(f)	(f)

[a] Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[b] Data transfer from General Metals Subcategory Option 4.
[c] Data transfer from General Metals Subcategory Option 2.
[d] Data transfer from Printed Wiring Board Subcategory Option 4.
[e] Data transfer from Oily Wastes Subcategory.
[f] See Table 10-8A, Total and Amenable Cyanide.
--- Not calculated due to insufficient data.
CBI - Confidential Business Information.

Table 10-8F

Episode-Level Long-Term Averages and Variability Factors for Nonchromium Anodizing Subcategory (Option 2)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Suspended Solids (TSS)	4856	7.6	1.74	1.22
	4869	16.4	6.92	2.38
Aluminum	4856	3.374	1.98	1.29
	4869	1.663	4.48	1.85
Manganese[b]	4762	0.139	1.64	1.20
	4807	0.050	2.08	1.31
	4871	0.092	1.35	1.11
	4904	0.013	2.22	1.35
Nickel[b]	1197A	0.557	---	---
	4277	0.178	1.18	1.06
	4438	0.415	---	---
	4470	0.231	1.95	1.28
	4761	0.266	---	---
	4762	0.206	2.11	1.32
	4807	0.264	2.24	1.35
	4811	0.047	1.93	1.36
	4817	0.034	2.16	1.33
	4833	0.051	---	---
	4834	0.330	2.26	1.35
	4847	0.054	3.16	1.56
	4871	0.652	1.41	1.13
	4904	0.026	----	----
	6048	0.346	3.15	1.56
Zinc[b]	1197A	0.030	---	---
	4277	0.028	3.30	1.59
	4415	0.223	---	---
	4417	0.165	2.41	1.39
	4470	1.380	1.69	1.21
	4737	0.137	4.45	1.84
	4761	0.159	---	---
	4762	0.201	1.60	1.19

Table 10-8F (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Zinc (continued)	4807	0.129	3.00	1.53
	4811	0.053	1.32	1.10
	4817	0.333	2.02	1.29
	4871	0.165	1.71	1.22
	4904	0.016	---	---
Oil and Grease (as HEM)[b]	4737	13.6	1.51	1.16
	4871	6.13	---	---

[a]Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[b]Data transfer from General Metals Subcategory Option2.
--- Not calculated due to insufficient data.
CBI - Confidential Business Information.

Table 10-8G

Episode-Level Long-Term Averages and Variability Factors for Printed Wiring Boards Subcategory (Option 2)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Total Cyanide	(b)	(b)	(b)	(b)
Amenable Cyanide	(b)	(b)	(b)	(b)
Chromium[c]	1197A	0.638	---	---
	4011	0.871	---	---
	4079	0.970	---	---
	4310	2.272	---	---
	4330	0.067	2.65	1.45
	4384	0.585	1.68	1.21
	4415	0.0488	---	---
	4417	0.0188	2.47	1.41
	4438	0.093	---	---
	4460	1.175	---	—
	4470	0.0773	1.73	1.22
	4811	0.0085	1.19	1.07
	4817	0.0925	6.02	2.19
	4833	0.0679	3.37	1.61
	4847	0.301	2.73	1.46
	4871	0.0101	---	---
	4904	0.0147	1.91	1.27
Copper[c]	4277	0.559	1.73	1.22
	4737	0.175	8.73	2.82
	4806	0.609	3.58	1.66
	4807	1.049	2.98	1.52
	4817	0.238	2.50	1.41
	4833	0.128	1.63	1.19
	4834	0.060	1.81	1.24
	4847	0.080	3.05	1.54
	4904	0.046	2.03	1.30

Table 10-8G (Continued)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Lead[c]	1197A	1.88	---	---
	4761	0.012	---	---
	4762	0.025	---	---
	4834	0.020	1.55	1.18
	4871	0.009	1.88	1.26
Manganese	4866	0.409	3.10	1.55
Nickel	4866	0.111	1.58	1.18
	4867	0.049	5.81	2.15
Tin	4866	0.120	3.17	1.56
	4867	0.037	4.69	1.90
Zinc[b]	1197A	0.030	---	---
	4277	0.028	3.30	1.59
	4415	0.223	---	---
	4417	0.165	2.41	1.39
	4470	1.381	1.69	1.21
	4737	0.137	4.45	1.84
	4761	0.159	---	---
	4762	0.201	1.60	1.19
	4807	0.129	3.00	1.53
	4811	0.053	1.32	1.10
	4817	0.333	2.02	1.29
	4871	0.165	1.71	1.22
	4904	0.016	---	---
Total Organic Carbon (TOC) (as indicator parameter)	4866	19.0	2.53	1.42
	4867	85.9	1.32	1.11
Total Sulfide[d]	4877	7.1	4.25	1.80

[a]Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to
calculate the LTAs and variability factors.
[b] See Table 10-8A, Total and Amenable Cyanide.
[c] Data transfer from General Metals Subcategory Option 2.
[d] Data transfer from Oily Wastes Subcategory.
--- Not calculated due to insufficient data.
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Table 10-8H

Episode-Level Long-Term Averages and Variability Factors for Printed Wiring Boards Subcategory (Option 4)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Chromium[b]	4807	0.036	3.95	1.74
	4854	0.014	1.69	1.21
	4882	0.140	8.61	2.80
Copper	4855	0.003	---	---
Lead	4855	0.021	---	---
Manganese[b]	4807	0.130	2.21	1.34
Nickel[b]	4807	0.751	2.75	1.47
	4854	0.034	6.80	2.33
Oil and Grease (as HEM)[b]	4737	13.6	1.51	1.16
	4871	6.13	---	---
Total Sulfide[d]	4877	7.1	4.25	1.80
Tin	4855	0.0547	1.58	1.18
Total Organic Carbon (TOC) (as indicator parameter)[e]	4866	19.0	2.53	1.42
	4867	85.9	1.32	1.11
Total Suspended Solids (TSS) [b]	4807	22.0	2.10	1.31
	4882	4.1	---	---
Zinc[b]	4807	0.040	1.87	1.49
	4854	0.012	1.84	1.36
	4882	0.036	2.70	1.52
Amenable Cyanide	(f)	(f)	(f)	(f)
Total Cyanide	(f)	(f)	(f)	(f)

[a] Concentrations for pollutants not detected in a sample are reported at the detection limit. In these cases, the detection limit was used to calculate the LTAs and variability factors.
[b] Data transfer from General Metals Subcategory Option 4.
c Data transfer from General Metals Subcategory Option 2.
[d] Data transfer from Oily Wastes Subcategory.
[e] Data transfer from Printed Wiring Board Subcategory Option 2.
[f] See Table 10-8A, Total and Amenable Cyanide.
--- Not calculated due to insufficient data.
CBI - Confidential Business Information.

Table 10-8I

Episode-Level Long-Term Averages and Variability Factors for Oily Waste Subcategory (Option 6)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Oil and Grease (as HEM)	4851	15.0	1.4	1.13
	4877	18.8	1.72	1.22
Total Sulfide	4877	7.1	4.25	1.80
Total Organic Carbon (TOC) (as indicator parameter)	4851	295	2.04	1.30
	4872	188	---	---
	4876	758	3.26	1.58
	4877	267	1.45	1.14
Total Suspended Solids (TSS)	4471	45.5	7.73	2.59
	4851	41.2	1.47	1.15
	4872	11.8	---	---
	4876	15.0	1.86	1.26
	4877	19.5	1.80	1.24

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).

Table 10-8J

Railroad Line Maintenance Subcategory (Option 10)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
BOD 5-Day (Carbonaceous)	6179	5.17	---	---
	4891[b]	---	6.90	2.39
	4892 [b]	---	6.03	2.19
Total Suspended Solids (TSS)	4891[b]	---	3.13	1.55
	4892[b]	---	2.34	1.37
	6179	10.7	---	---
Oil and Grease (as HEM)	4892[b]	---	1.71	1.19
	4891[b]	---	1.82	1.25
	6179	6.22	---	---

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
[b]Data transfer from Shipbuilding Dry Dock Subcategory.
---No samples collected on this day.
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Table 10-8K

Shipbuilding Dry Dock Subcategory (Option 10)

Regulated Pollutant	Episode	Long-Term Average Concentration[a] (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor
Oil and Grease (as HEM)	4891	6.2	1.71	1.19
	4892	11.8	1.82	1.25
Total Suspended Solids (TSS)	4805	29.5	---	—
	4891	11.6	3.13	1.55
	4892	55.0	2.34	1.37

[a]Pollutants not detected in an effluent sample are reported at the detection limit. In these cases, concentrations at influent to treatment were determined to be at treatable concentrations (see Section 10.2).
---No samples collected on this day.
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Table 10-9A

Pollutant-Level Long-term Averages, Variability Factors and Limitations for General Metals Option 2

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	19	12	12	2.9	1.5	34	18
Oil and Grease (as HEM)	2	1	9.9	1.6	1.2	15	12
Total Organic Carbon (TOC) (as indicator parameter)	10	8	37	2.4	1.4	87	50
Total Organics Parameter (TOP)	42	12	2.3	3.9	1.8	9.0	4.3
Cadmium	5	2	0.08	2.0	1.3	0.14	0.09
Chromium	17	9	0.10	2.7	1.5	0.25	0.14
Copper	9	9	0.17	3.2	1.6	0.55	0.28
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.65	0.14	0.07
Lead	5	2	0.02	1.8	1.3	0.04	0.03
Manganese	4	4	0.07	1.9	1.3	0.13	0.09
Molybdenum	2	2	0.38	2.1	1.3	0.79	0.49
Nickel	15	10	0.24	2.2	1.4	0.50	0.31
Silver	4	3	0.05	4.7	2.0	0.22	0.09
Total Sulfide	1	1	7.1	4.3	1.80	31	13
Tin	2	2	0.44	3.0	1.6	1.4	0.67
Zinc	13	9	0.16	2.4	1.4	0.38	0.22

Table 10-9B

Pollutant-Level Long-term Averages, Variability Factors and Limitations for General Metals Subcategory (Option 4)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	2	1	13	2.1	1.4	28	18
Oil and Grease (as HEM)	2	1	9.9	1.6	1.2	15	12
Total Organic Carbon (TOC) (as indicator parameter)	10	8	37	2.4	1.4	87	50
Total Organics Parameter	42	12	2.3	3.9	1.8	9.0	4.3
Cadmium	1	1	0.01	1.8	1.3	0.02	0.01
Chromium	3	3	0.04	4.8	2.0	0.17	0.07
Copper	3	3	0.08	5.9	2.2	0.44	0.16
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.7	0.14	0.07
Lead	1	---	0.03	1.6	1.2	0.04	0.03
Manganese	1	1	0.13	2.3	1.4	0.29	0.18
Molybdenum	2	2	0.38	2.1	1.3	0.79	0.49
Nickel	2	2	0.40	4.7	1.9	1.88	0.75
Silver	1	1	0.02	3.0	1.8	0.05	0.03
Total Sulfide	1	1	7.1	4.3	1.8	31	13
Tin	1	1	0.02	1.6	1.2	0.03	0.03
Zinc	3	3	0.04	2.2	1.5	0.08	0.06

Table 10-9C

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Metal Finishing Job Shops Subcategory (Option 2)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	NA	NA	NA	NA	NA	60[a]	31[a]
Oil and Grease (as HEM)	NA	NA	NA	NA	NA	52[a]	26[a]
Total Organic Carbon (as indicator parameter)	1	1	51	1.6	1.2	78	59
Total Organics Parameter	42	12	2.3	3.9	1.8	9.0	4.3
Cadmium	4	2	0.05	4.5	1.9	0.21	0.09
Chromium	6	3	0.31	4.3	1.8	1.3	0.55
Copper	6	3	0.34	4.0	1.8	1.3	0.58
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.7	0.14	0.07
Lead	3	1	0.07	1.8	1.3	0.12	0.09
Manganese	4	2	0.05	5.0	2.0	0.25	0.10
Molybdenum	2	2	0.38	2.1	1.3	0.79	0.49
Nickel	5	4	0.39	3.7	1.7	1.5	0.64
Silver	3	1	0.04	4.5	1.9	0.15	0.06
Total Sulfide	1	1	7.1	4.3	1.8	31	13
Tin	1	1	1.3	1.5	1.2	1.8	1.4
Zinc	8	4	0.11	3.3	1.6	0.35	0.17

[a] For existing sources, limits are transferred from 40 CFR 433 (Metal Finishing).
NA - Not applicable.

Table 10-9D

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Metal Finishing Job Shops Subcategory (Option 4)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	2	1	13	2.1	1.4	28	18
Oil and Grease (as HEM)	2	1	9.9	1.6	1.2	15	12
Total Organic Carbon (TOC) (as indicator parameter)	1	1	51	1.6	1.2	78	59
Total Organics Parameter	42	12	2.3	3.9	1.8	9.0	4.3
Cadmium	1	1	0.01	1.8	1.3	0.02	0.01
Chromium	3	3	0.04	4.8	2.0	0.17	0.07
Copper	3	3	0.08	5.9	2.2	0.44	0.16
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.7	0.14	0.07
Lead	1	---	0.03	1.6	1.2	0.04	0.03
Manganese	1	1	0.13	2.3	1.4	0.29	0.18
Molybdenum	2	2	0.38	2.1	1.3	0.79	0.49
Nickel	2	2	0.40	4.7	1.9	1.88	0.75
Silver	1	1	0.02	3.0	1.8	0.05	0.03
Total Sulfide	1	1	7.1	4.3	1.8	31	13
Tin	1	1	0.02	1.6	1.2	0.03	0.03
Zinc	3	3	0.04	2.2	1.5	0.08	0.06

Table 10-9E

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Non-Chromium Anodizing Subcategory (Option 2)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	2	2	12	4.4	1.8	52 [a]	22 [a]
Oil and Grease (as HEM)	2	1	9.9	1.6	12	15[a]	12 [a]
Aluminum	2	2	2.6	3.3	1.6	8.2	4.0
Manganese	4	4	0.07	1.9	1.3	0.13	0.09
Nickel	15	10	0.24	2.2	1.4	0.50	0.31
Zinc	13	9	0.16	2.4	1.4	0.38	0.22

[a] As shown in Section 14.0 EPA transferred limits for TSS and oil and grease for existing sources from 40 CFR 433 (Metal Finishing). The limits for TSS and oil and grease shown in this table are being proposed for new sources.

Table 10-9F

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Printed Wiring Boards (Option 2)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	NA	NA	NA	NA	NA	60 [a]	31[a]
Oil and Grease (as HEM)	NA	NA	NA	NA	NA	52 [a]	26[a]
Total Organic Carbon (TOC) (as indicator parameter)	2	2	53	2.0	1.3	101	67
Total Organics Parameter	42	12	2.3	3.9	1.8	9.0	4.3
Chromium	17	9	0.10	2.7	1.5	0.25	0.14
Copper	9	9	0.18	3.2	1.6	0.55	0.28
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.7	0.14	0.07
Lead	5	2	0.02	1.8	1.3	0.04	0.03
Manganese	1	1	0.41	3.1	1.6	1.3	0.64
Nickel	2	2	0.08	3.7	1.7	0.30	0.14
Total Sulfide	1	1	7.1	4.3	1.8	31	13
Tin	2	2	0.08	4.0	1.8	0.31	0.14
Zinc	13	9	0.16	2.4	1.4	0.38	0.22

[a] For existing sources, limits are transfered from 40 CFR 433 (Metal Finishing).

Table 10-9G

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Printed Wiring Boards (Option 4)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily[1]	Maximum Monthly Avg.[1]
Total Suspended Solids (TSS)	2	1	13	2.1	1.4	28	18
Oil and Grease (as HEM)	2	1	9.9	1.6	1.2	15	12
Total Organic Carbon (TOC) (as indicator parameter)	2	2	53	2.0	1.3	101	67
Total Organics Parameter (TOP)	42	12	2.3	3.9	1.8	9.0	4.3
Chromium	3	3	0.4	4.8	2.0	0.17	0.07
Copper	1		0.01	1.6	1.2	0.01	0.01
Total Cyanide	13	9	0.09	2.4	1.4	0.21	0.13
Amenable Cyanide	8	5	0.04	3.4	1.7	0.14	0.07
Lead	1		0.03	1.6	1.2	0.04	0.03
Manganese	1	1	0.13	2.3	1.4	0.29	0.18
Nickel	2	2	0.40	4.7	1.9	1.88	0.75
Total Sulfide	1	1	7.1	4.3	1.8	31	13
Tin	1	1	0.06	1.6	1.2	0.09	0.07
Zinc	3	3	0.04	2.2	1.5	0.08	0.06

Table 10-9H

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Oily Wastes Subcategory (Option 6)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	5	4	20	3.3	1.6	63	31
Oil and Grease (as HEM)	2	2	17	1.6	1.2	27	20
Total Organic Carbon (TOC) (as indicator parameter)	4	3	282	2.3	1.4	633	378
Total Organics Parameter	42	12	2.3	3.9	1.8	9.0	4.3
Total Sulfide	1	1	7.1	4.3	1.8	31	13

Table 10-9I

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Railroad Line Maintenance Subcategory (Option 10)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/L, ppm)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
5-Day Biochemical Oxygen Demand (BOD_5)	1	2	5.2	6.5	2.3	34	12
Total Suspended Solids (TSS)	1	2	11	2.8	1.5	30	16
Oil and Grease (as HEM)	1	2	6.3	1.8	1.3	11	7.6

Table 10-9J

Pollutant-Level Long-term Averages, Variability Factors and Limitations for Shipbuilding Dry Docks Subcategory (Option 10)

Regulated Parameter	Number of Sites (LTA)	Number of Sites (VF)	Median LTA (mg/, ppml)	1-Day Variability Factor	4-Day Variability Factor	Maximum Daily (mg/L, ppm)	Maximum Monthly Avg. (mg/L, ppm)
Total Suspended Solids (TSS)	3	2	30	2.8	1.5	81	44
Oil and Grease (as HEM)	2	2	9.0	1.8	1.3	16	11

Source: MP&M LTA Database.